DESIGN ANALYSIS REPORT
ASARCO EAST HELENA
CORRECTIVE ACTION MANAGEMENT UNIT (CAMU)
PHASE 2 CELL

Prepared For:

ASARCO LLC
P.O. Box 1230
East Helena, MT 59635

Hydrometrics, Inc.
consulting scientists and engineers

JANUARY 2007

REVISED MAY 2007

REVISED JUNE 2007

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Prepared for:

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Prepared by:

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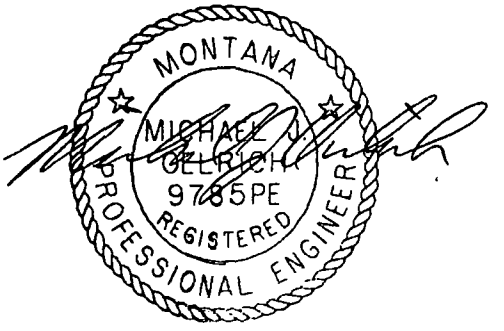

January 2007
Revised May 2007
Revised June 2007

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IX. Responses to May 28, 2007 Initial Comments On Design Analysis Report Asarco East Helena Plant Corrective Action Management Unit (CAMU) Phase 2 Cell Revised May 2007

Comment 1. Conditions of Approval, Comments 1, 5, and 9, ASARCO responded by acknowledging EPA's conditions for approval. It is our understanding that the company intends to comply with each of these stated requirements.

Response: Asarco agrees to comply with the requirements of Comments 1, 5, and 9.

Comment 2. Page x, Asarco Response to EPA's Comment # I.A.2: Please amend Section 8.0 References to include the reference "EPA 1986" cited here.

Response: The reference U.S. EPA, 1986. "Design Construction, and Evaluation of Clay Liners for Waste Management Facilities." Report No. EPA/530/SW-86/007F has been added to Section 8.0 of the Design Report. The cited phrase from the reference is found on Page 6-13 of the EPA document.

Comment 3. Page xiv, EPA's Comment #I.C.1, Appendix G Table 4-1 Stockpile Acceptance Testing, Appendix G, 4.0 Compact Clay Liner, page 4-4, and Appendix J, Table 4-1, Stockpile Acceptance Testing: The text and tables specify that the hydraulic conductivity must not exceed 10^{-6}. Asarco must modify the text and tables to specify 1.0 x 10^{-6}. We wish to clarify that it remains the project goal that the compact clay liner achieves a hydraulic conductivity of 1.0 x 10^{-7}; however, given the results of the geotechnical work, EPA established a performance standard of a hydraulic conductivity of no greater than 1.0 x 10^{-6}. Please make note of this here and throughout the remainder of the design where 10^{-6} is used rather than 1 x 10^{-6}. Please do not interpret this as any value between 1.0 x 10^{-6} to 9.9 x 10^{-6} as being permissible.

Response: All references to 10^{-6} have been changed to read 1.0 x 10^{-6} with the understanding that a hydraulic conductivity of 1.0 x 10^{-7} is the project goal as shown in replacement Table 4-1 of Appendix G, Page 4-4 of Appendix G, and Table 4-1 of Appendix J.

Comment 4. Page xiv, Response to Comment 6, please expand the text to include additional construction specifications and descriptions for the pumps, sumps, riser pipes, and methods for construction of these items.

Response: Section 3.7.2.1 of the Design Report has been expanded to include descriptions of the piping, sumps, and riser pipes as found on replacement page 3-26. No pumps are included in the design of the leachate collection or detection systems, because significant leachate generation from the waste is not anticipated. Therefore, a portable submersible pump will be used to remove leachate from the sumps if any is noted during inspections.

Comment 5. Page xxi, Waste Materials, please amend this table to correctly identify which of these wastes will require neutralization.

Response: The table has been corrected and is shown below.

WASTE MATERIALS

Solid Waste Material	*Location*	*Approximate Volume*
Sulfates	*Acid Plant Pipes, Towers, and Tanks*	*10 – 20 Tons*
*Sulfuric Acid (Neutralized)**	*Acid Plant Pipes, Towers, and Tanks*	*5 – 50 Gallons*
Soda Ash	*Bin 17 Under Highline Railroad*	*4 Cubic Yards*
Catalyst	*Acid Plant Converter*	*120,000 Liters*
Talc	*Talc Room at Blast Flue*	*500 Pounds*
Blast Furnace Dust	*Blast Flue, Loadout, and Baghouse*	*30 Tons*
Wood Chips	*Bin 18 Under Highline Railroad*	*2 Tons*
Lead Bullion	*Ringling Building*	*50 Tons*
Matte	*Ringling Building*	*10 Tons*
Speiss	*Ringling Building*	*10 Tons*
Dross	*Ringling Building*	*20 Tons*

* Liquid that will be neutralized and solidified prior to placement in CAMU Phase 2 Cell.

Comment 6. Page xxii, Waste Approved for Disposal in the CAMU, We understand that you have proposed to include soil sampling and temporary capping as part of the demolition work. Due to the nature of this activity, it more appropriately falls under the scope and auspices of the EPA RCRA corrective action work. Removal of excess soils would also fall under EPA's corrective action authority. Please amend the table to reflect this.

Response: The table has been corrected to show removal of excess soils will be excavated under EPA Corrective Action Authority. The changes are found on the table below.

WASTE APPROVED FOR DISPOSAL IN THE CAMU

Category	*Waste Material Examples*
Montana Decree Waste (Direct result of performing Montana Decree cleaning and demolition)	*- Brick, masonry, and kettles* *- Fiberglass, pipe, and ACM transite* *- Soils, slag, and asphalt* *- Concrete blocks, walls, and slabs* *- Furnace metal, dust and lead residue* *- Baghouse bags, belting, lighting* *- Plastic/ceramic saddles and catalyst* *- Rail ties, wood, blankets, insulation*
Contaminated Debris (Waste located throughout the facility and subject to future Montana Decree action)	*- Industrial-sized vacuum hose* *- Wood planking* *- Railroad ties and pallets* *- Concrete slabs/blocks/rubble* *- Plastic/PVC piping/rubber belting* *- Wood chips, soda ash, talc* *- Soda ash and lime* *- In Plant Road Sweepings* *- Slag (mixed with debris)* *- Temporary stack* *- Wood fire houses* *- Adobe clay pile*
Montana Decree 2005 Work Plan	*- Acid plant limerock* *- Zinc plant copper*
Excess Contaminated Soil	*- Excess soil excavated under RCRA Decree source control program from slurry wall, PRB* *- Excess soil excavated under Montana Decree interim capping program* *- Excess soil excavated under final site wide cap program* *-Excess soil excavated under EPA Corrective Action Authority*

Comment 7. Page xxiv, Asarco's Response to EPA's comment E.1: Asarco should explain what material it intends to use for the cushion layer.

Response: Imported local gravel meeting the gradation requirements specified by EPA and Section 203.07.8 A.2 of Appendix J will be used in construction of the cushion layer.

Comment 8. Page xxx, Asarco's Response to Comment E.17, Use of Construction Stakes. Here the text indicates that rather than stakes or a laser beam, an inspector will observe the lift thickness; however, in Appendix J, Project Specifications, 203.07.01 and Table 4-2, indicate that construction stakes will be used. Please amend the text to indicate that an inspector rather than stakes will be used during construction.

Response: Table 4-2 in Appendix J Section 203.07.01 has been changed to clarify that construction stakes (grade stakes) for grade control will be inventoried as part of the contractor's QC. The specifications in Table 4-2 have been clarified to reflect this as found on replacement page 3 of Section 203.07.01 of Appendix J. Table 4-2 is not meant to imply that stakes will be used for lift thickness QC.

Comment 9. Page xxxi, Comment 20, please expand the text to provide further details on the pumps, piping and drainage layers for the leak detection and leachate collection system.

Response: The text has been expanded to provide further QA/QC details for the Leachate Collection and Detection system as described in replacement page 8-1 of Appendix G. Additional details of the drainage layers are found in Sections 3.0 (Pages 3-1 through 3-5), and 6.0 (Pages 6-1 through 6-2) of Appendix G and are not included as replacement pages. Additional text has been added to the design report to provide additional details of the Leachate Collection and Detection Systems as outlined in our response to Comment 4.

Comment 10. Page xxxii, Comment 2, EPA acknowledges that this is not intended to be the SOP PD for the asbestos removal but recognizes that the EPA-approved CAMU Phase 2 Cell will be used for final disposal of the removed asbestos-containing material. Please provide additional specifics on the removal, segregation, containerization, labeling, and transport of the asbestos material, as well as how this disposal will be noted on any future deed restriction.

Response: The text has been expanded to provide further specifics on the removal, segregation, containerization, labeling, and transport of the asbestos material, as well as how this disposal will be noted on any future deed restrictions as shown on replacement page 3-2, 3-3 and Attachment A of Appendix E.

Comment 11. Page xxxiii, Comment 6, please provide the requested analytical data, such as any available TCLP data. During a discussion on May 11, 2007, ASARCO indicated its willingness to perform sampling of stored materials and newly demolished materials on a load basis. Please submit this proposal, including the number of samples and analytical parameters in response to these additional comments.

Response: Asarco has no analytical data for the demolition debris waste. A sampling and analysis plan for the waste has been added as Attachment C to the Operating Plan in Appendix E.

Comment 12. Page xxxv, Comment 3, please revise your "Waste Hauling Plan" to incorporate all components from the O&M Plan, Appendix H, and Appendix J, into one Operating Plan that addresses the requirements of EPA's comment.

Response: The Waste Hauling Plan (Appendix H) has been combined with the Operating Plan (Appendix E), which describes operation, maintenance, waste hauling, dust control, inspection criteria, closure, and post-closure. Appendix E includes all of the following mechanics of waste transport requested:

1. *Conditions to halt waste placement and transport such as wind direction and precipitation events – Section 3.6;*
2. *Communications – Section 1.3;*
3. *Sorting and Sizing – Section 3.1;*
4. *Sampling – Section 3.2;*
5. *Spill Response – Section 3.8;*
6. *Weight – Section 3.2;*
7. *Identification of Wastes Requiring Special Management – Section 3.5;*
8. *Pretreatment – Section 3.5;*
9. *Oversize Material – Section 3.1;*
10. *Security – Section 1.5;*
11. *Dust Control – Throughout Section 3.0;*
12. *Odor Control – There is no need for odor control, therefore this item is not discussed in Appendix E; and*
13. *Decontamination of Equipment used to Transport, Place, and Compact Materials – Section 3.7. Sizing and sorting of materials will be done at the demolition site and will be decontaminated on-site; therefore, this equipment is not discussed in Appendix E.*

Comment 13. Page xxxv, Comment 4, please clarify what is meant by your response in regard to limitation of waste size to a vertical distance of two feet. Will there be any waste sizing? If so, please amend the appropriate portions of the text to describe this in detail.

Response: Some large pieces of concrete or metal debris may need to be resized in order to make the vertical dimension of the debris 2 feet or smaller, however, there is no size restriction to the horizontal or width dimension of the waste except that it needs to be small enough to fit in a haul truck. Larger pieces will result in less void space and reduce the potential for settlement. This debris will be placed in the cell so the 2 foot or smaller dimension is the vertical dimension. The text "All material requiring size reduction will be resized at the structure demolition site using excavators with concrete breakers or shears." has been added to the text as shown on replacement page 4-1.

Comment 14. Page xlvi, Comment 6, regarding inspection requirements for the two CAMU cells, please allow us to reiterate the relevant portions from EPA's April 25, 2007 letter:

> **"...ASARCO must adhere to the current monthly CAMU inspection requirements until an approved post closure plan is approved for both closed CAMU cells. If ASARCO wishes to alter its currently approved monitoring program for CAMU Cell 1, please submit a formal request to the EPA project manager. Further, as stated in an April 18, 2007, email, the intent of the original CAMU Phase 2 Cell comment, Section VII. Post Closure Care, Comment 5, was to require more frequent formal inspections by a professional engineer rather than a five-year evaluation frequency as proposed by ASARCO."**

Response: Asarco will comply with the inspection requirements provided in the EPA April 25, 2007 letter for the two CAMU cells.

Comment 15. Page xlviii, Asarco's Response to EPA's Comment VIII.1: Following approval of the design of the CAMU Phase 2 Cell, please provide a detailed construction schedule similar to Figure 4-1 Construction Schedule in the Phase 1 Design.

Response: A Construction Schedule, similar to the one provided in the Phase I Design, has been provided in replacement Appendix F. This schedule will be updated once the project begins.

Comment 16. Page xlviii, Asarco's Response to EPA's Comment VIII.2. Please note that this response erroneously references a Montana Department of Environmental Quality (MDEQ) response to Hydrometrics' letter dated June 16, 2006. The MDEQ's files do not include a response to Hydrometrics or Asarco. We believe the response is referencing a July 11, 2006 letter from EPA that approved the geotechnical work.

Response: Although MDEQ did not respond directly to Hydrometrics' letter dated June 16, 2006, which was sent to the MDEQ, EPA response stated that MDEQ had received the letter, reviewed it, and approved of the proposed plan for geotechnical and site investigation. We apologize if our assumption that this letter represented a response from DEQ was in error.

Comment 17. Section 3.6 and Section 3.7: The gas migration layer and cushion layer on top of the waste is inconsistent between Figure 3.5 and Figure 3-6. This should be corrected.

Response: Figure 3-6 has been revised to show the cushion layer as the 12", as required by Comment 3 on page xliii and not 24". This change is shown on replacement Figure 3-6.

Comment 18. Section 3.7 Component Design: The gas migration layer is not discussed in the component design section. A brief description should be included. In addition, Asarco should clarify how many vent pipes are proposed for the gas vent system.

Response: A discussion of the gas migration layer along with the number of vent pipes has been added to Section 3.7.3 as shown on replacement page 3-27.

Comment 19. Section 3.7.1.3 Cap Composite Liner: The requirements for the geosynthetic clay liner listed in this section are also applicable to the GCL that is on top of the compact clay liner. This point is not clear in the Design Report and should be clarified in Section 3.7.1.2.

Response: The following text has been added to Section 3.7.1.2 as shown on replacement page 3-22: "The geosynthetic clay liner will be needle punch reinforced GCL comprised of a uniform layer of granular sodium bentonite encapsulated between a scrim reinforced non-woven and a virgin staple fiber non-woven geotextile. The needle-punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond. All seams must be overlapped a minimum of 12 inches and sealed with powdered bentonite sealing compound. Seams must be oriented parallel to the line of maximum slope. No horizontal seams should be allowed on the slopes."

Comment 20. Section 3.7.1.3 Cap Composite Liner: This section states the cap liner will consist of a 40-mil double-sided textured HDPE FML on top of a geosynthetic clay liner (GCL). However, various figures and specification sheets do not match the text and appear to have the GCL on top of the FML. The following figures and sheets must be modified: Figure 3-6; Sheet Number 28; and Sheet Number 30.

Response: Figure 3-6 and Sheets 28 and 30 have been revised to clearly show the 40-mil double-sided textured HDPE FML on top of the GCL.

Comment 21. Section 5.0, Temporary Cap: please explain how the 10 ounce cushion fabric from the temporary cap, which will not be reusable, will be sized before disposal in the cell.

Response: The cushion fabric will be shredded or cut into pieces no larger than 36 square feet before placement in the cell. The contractor will be required to place the pieces flat and distribute the pieces of fabric evenly throughout the cell as described on replacement page 5-1.

Comment 22. Appendix G 4.0 Compact Clay Liner, page 4-4: The text discusses conformance testing of the compact clay liner following completion. As reflected in Comment 3, the text should be revised to specify that the hydraulic conductivity must not exceed 1.0×10^{-6} not simply 10^{-6}. In addition, the text must include provisions for discussion with EPA and approval of the liner by EPA if any of the conformance tests do not meet the standard. EPA and Asarco will need to agree on a path forward such as rejecting the liner or mitigation to decrease the conductivity.

Response: Page 4-4 of Appendix G has been revised to state that if any of the specimens have a hydraulic conductivity in excess of $1x10^{-6}$cm/sec, Asarco will consult with EPA on what actions will be taken to mitigate the overall conductivity of the CCL.

Comment 23. Appendix H Section 2.0 Dust Control: The dust control plan appears to adequately address dust control during transportation unless there are high wind or precipitation events. Please specify whether work stoppage criteria apply to on-site and off-site transport. If transport is halted, please amend the text to indicate that trucks containing wastes will be tarped until conditions improve.

Please state where the wind speed numbers are obtained. We assume the Helena airport. We also suggest installation of wind socks strategically placed as an indicator of high wind conditions requiring work stoppage.

Wastes already in place in the CAMU may be a fugitive emission source. The dust control plan must include control measures for waste already disposed of in the CAMU. Fugitive emission may not simply be "nuisance dust" but may be hazardous waste containing emissions. Therefore, fugitive emissions must be diligently controlled. We recommend inspections of the cell at least twice daily to assess the potential for windblown dispersion and establishment of procedures to address visible releases from the cell. Please amend the Operating Plan (refer to Comment 12 above) to include provisions for this.

Response: The Waste Hauling Plan has been included in Appendix E – Operating Plan. Section 3.6 of Appendix E has been updated to specify that work stoppage criteria applies to both on-site and off-site transport and that in the event that transport is halted, no additional trucks will be loaded and any trucks containing wastes will be covered until conditions improve.

Section 3.6 of Appendix E states – "Sustained wind speeds will be monitored by management personnel through the use of a calibrated on-site wind sock; as well as, through data provided by the National Oceanic and Atmospheric Administration (NOAA) at www.noaa.gov for wind speeds at the Helena Airport."

Section 3.3 of Appendix E addresses the need for control measures for fugitive dust emissions created by waste already placed in the CAMU and includes inspections of the CAMU cell and surrounding areas twice daily. Daily inspections are addressed in Section 6.1 of Appendix E.

Comment 24. Appendix H, Waste Hauling, 2.3 and 4.0: Please expand this plan to describe how and where wastes within the transport vehicles is removed. If the haul truck tires contact the hazardous wastes within the cell, decontamination must occur before they enter the haul roads. Please Expand Section 4.0 to describe how and where equipment used within the cell will be decontaminated.

Response: Wastes will simply be dumped from haul trucks into the CAMU Phase 2 Cell where they will be placed and compacted by designated equipment. As stated in Section 3.7 of Appendix E, "Haul trucks leaving the CAMU Phase 2 Cell will be traveling on paved haul roads and will not be decontaminated until they enter the ASARCO smelter facility, where they will be decontaminated. Any large debris will be knocked off of haul trucks as they

leave the CAMU Phase 2 Cell. The section of haul road between the CAMU Phase 2 Cell and the ASARCO smelter facility will be constantly monitored and swept on a regular basis. This section of haul road will be inspected twice daily." "Equipment used in the CAMU cell for spreading and compacting waste will be decontaminated at the ASARCO smelter facility. This equipment will be placed on trailers and driven via the haul road back to the ASARCO smelter facility, where it will be decontaminated." By requiring the contractor to pave the haul roads and continually sweep them, Asarco's intent is to control contamination without the muddier alternatives of wheel washing.

Comment 25. Appendix H, Waste Hauling: Please expand this plan to include the daily inspections requested in Comment 23 above, as well as weekly inspections of fences, gates, condition of haul roads, storm water pond, presence of precipitation run-off or ponded liquids, decontamination pads, etc. Please develop forms to document these inspections.

Response: The Operating Plan – Appendix E includes Section 6.0 – Site Monitoring and Inspection, which has been expanded to include daily and weekly inspections as requested. Inspection forms for Daily and Weekly Inspections have been added to Appendix E – Attachment B to accompany the Monthly and Semi-Annual Inspection Form.

Comment 26. Appendix I Sheet 26 and Sheet 27: The cushion material size specifications are inconsistent. Sheet 27 should be corrected to match Sheet 26

Response: Sheet 27 has been corrected to match Sheet 26 as shown on replacement Sheets 27 and 26.

Comment 27. Appendix I Sheet 30: Please explain "construction geotextile" on Sheet 30.

Response: No construction geotextile is to be used and has been removed from Sheet 30 as shown on the revised Sheet 30.

Comment 28. Appendix J: Table 4-1 Stockpile Acceptance Testing should be revised to specify the hydraulic conductivity must not exceed 1.0×10^{-6}, as reflected in Comment 3 above.

Response: Table 4-1 has been revised to show hydraulic conductivity must not exceed $1.0x10^{-6}$ as shown on revised Table 4-1 of Appendix J.

Comment 29. Appendix J; 203.07.8, A. 3. Waste Material, please describe how and where the size reduction of the demolition debris, both newly generated and stored wastes, will occur, and amend the text to include this discussion.

Response: The text has been amended to include "All material requiring size reduction will be resized at the structure demolition site and all stored material requiring size reduction will be resized at the location the material is stored" as shown on replacement page 7 of Appendix J.

Comment 30. Appendix J, Section 203.07.07 D. 2 and 2, the text lists 8 inches of excavated soil for use as topsoil and 16 inches of soil for use as subsoil; however, on page xliv, in response to Comment 6, ASARCO indicates that a cover of 6 inches of seeded topsoil will be placed over 24 inches of subsoil. Please amend Appendix J to reflect this proposed cap design.

Response: This section of the specification refers to stripping of the soil prior to excavation of the cell. The contractor will be required to strip the top 8 inches of material for use in the 6- inch topsoil cap requirement and then strip the next 16 inches of subsoil for use in the 24-inch subsoil cap requirement. The deficiency of subsoil will be made up with excess material from the remainder of the cell excavation.

Comment 31. Appendix J: Please note that Section 203.07.7 D.3. on page 6 erroneously discusses the compacted clay cover. A clay cover is not proposed for the Phase 2 CAMU. Please amend the text.

Response: The clay cover reference has been removed as shown on replacement Page 6, Section 203.07.7 D.3 of Appendix J.

Comment 32. Appendix J, 203.07.8 C.1, page 9, please explain whether the specifications have erroneously required a compaction to 90 percent Proctor maximum dry density rather than 95 percent, as listed in Table 4-2, QC Testing for CCL Placement.

Response: The 90 percent Proctor maximum dry density requirement in Section 203.07.8 C.1 on Page 9 of Appendix J is in reference to the ***subgrade*** *below the Compacted Clay Liner. To help clarify this statement, the following text has been added to Section 203.07.8 C.1 on Page 9 of Appendix J: "prior to placement of the compacted clay liner" as shown on replacement Page 9 of Appendix J.*

Comment 33. Appendix J, 203.07.8 C.1. b.1, the project specifications state that "No more than 20 percent of the material represented by the samples shall be at dry density less than 95 percent of Proctor maximum dry density." Please correct this to reflect that not more than 3%, rather than 20%, outliers are allowed.

Response: The reference has been changed to 3% as shown on replacement page 10 of Appendix J.

Comment 34. Appendix J, 623.02, A.: Table 4. Geomembrane Specifications may contain an error of the gauge for the CAMU CAP. The value listed is 20 mils. The designed cap liner should be 40 mil. Also Table 4 Geomembrane Specifications and Table 5-1 Manufacture's QA Test for FML include discrepancies between them; for example, tear strength values differ between Table 4 and Table 5-1. Please reconcile these tables.

Response: Table 4 has been changed to reflect the 40 mil liner for the CAMU Cap and the design values have been reconciled against Table 5-1 as shown on Revised Page 2 of Section 623.02 of Appendix J.

Comment 35. Appendix J: Page 3, Section 625.05.7 Cover Placement discusses placing soil over the GCL. For the CAMU Phase 2 Cell's bottom and cap, soil should not be placed directly on the GCL. Asarco must amend these specifications to ensure their consistency with the proposed design.

Response: The reference to placing soil over the GCL has been removed from Page 3 of Section 625.05.7 of Appendix J.

Comment 36. Appendix J; 203.07.8 C. 7. Waste Materials, please specify whether crushed slag, imported gravel or select fill will be used.

Response: Section 203.07.8 C.7 Page 7 of Appendix J has been modified to state that imported gravel will be used as cushion material.

X. Responses to June 2, 2007, Additional Comments on the Revised Design Analysis Report for the ASARCO East Helena Smelter CAMU Cell 2

Comment 1. Section 3.4, Soil Materials. This section states: "Results from the geotechnical investigation indicate the site soil is suitable for use in construction of the compacted clay liner for the CAMU Phase 2 cell." As stated in Section 3.2, however, Geotechnical Investigation, this is only true with the addition of a geosynthetic clay liner (GCL) as required by the U.S. EPA. Please amend the text to reflect this.

Response: The text in Section 3.4 has been changed to read:" As explained in Section 3.2, results from the geotechnical investigation indicate that site soil may not be suitable for use in construction of the compacted clay liner for the CAMU Phase 2 Cell therefore a geosynthetic clay liner (GCL) will be placed above the compacted clay liner to meet the hydraulic conductivity performance requirements" as shown on replacement page 3-12 of the Design Report.

Comment 2. Appendix C, Design Analysis: The design/analysis of the FML, Geonet, anchor trench, selection of the cover soil cap slope, concrete sump footing, cell settlement, and leachate system capacity appear to be accurate and in accordance with the accepted design standards. However, a similar design/analysis for the GCL is missing. Please submit this in your responses.

Response: An analysis of the GCL has been included in Appendix C.

Comment 3. Appendix F, Construction Schedule: The proposed duration of the identified CAMU construction activities appears reasonable; however, the chart will require updating to reflect revised work start dates.

Response: An updated construction schedule has been added to Appendix F as shown on replacement Appendix F.

Comment 4. Appendix I, Project Drawings: Only Sheets 24 through 32 are attached to the design report. Please clarify whether there are other sheets which deal with the construction of the CAMU and submit them with your responses.

Response: Sheets 1 through 23 are for the Asarco Smelter Cleaning and Demolition portion of the project and do not deal with construction of the CAMU.

Comment 5. Appendix I, Project Drawings, Sheet 28: The required 24-inch thick cushion layer on top of the bottom liner, while shown on both Sections A and B, is not identified. See Figure 3.5 of the design report for similar sections with proper identification.

Response: Sheet 28 has been revised to identify the 24-inch thick cushion layer as shown on revised Sheet 28.

Comment 6. Appendix J, Project Specification Division 200—Earthwork, Page 10: In discussion of compaction of the cushion layer, drainage layer, drain layer, gas migration layer, and subsoil, the specification calls for light rolling of the layer. It would be appropriate to identify an acceptable class of rolling equipment (perhaps by maximum weight) to accomplish the required compaction, while minimizing the potential for damage to the underlying liner components.

Response: Nonvibratory compaction equipment with a static weight of 1.5 tons or less has been specified for light rolling of the cushion layer, drainage layer, drain layer, gas migration layer and subsoil has been added to Page 10 as shown on revised Page 11 of Appendix J.

Comment 7. Appendix J, Project Specification Division Section 625—GCL, Page 3, Paragraph 1 of Section 625.04 should be modified to include the following text: "The needle punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond."

Response: The text "The needle punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond" has been added to Page 3 as shown on replacement Page 3, Paragraph 1 of Section 625.04 in Appendix J.

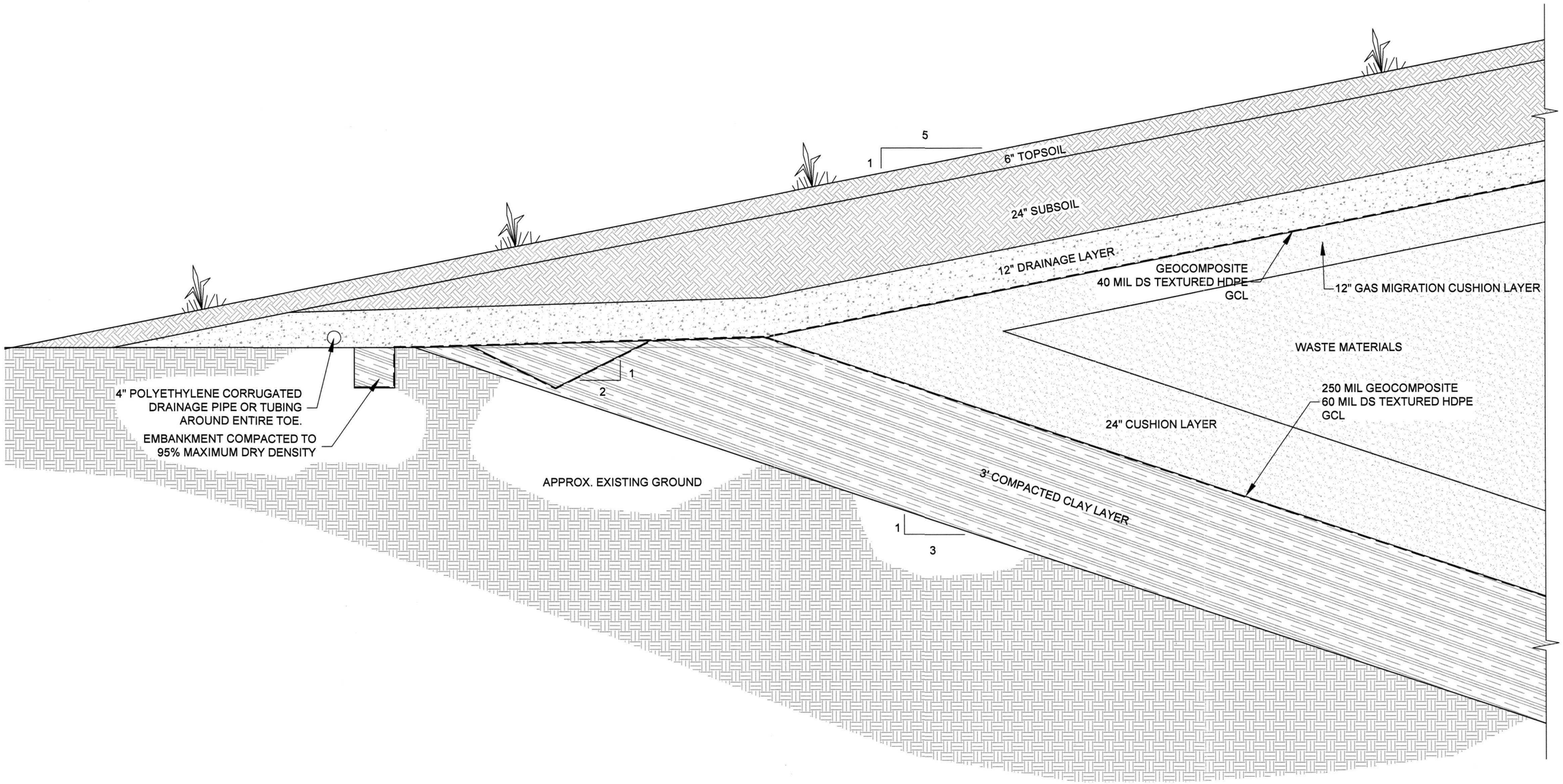
Comment 8. Appendix J, Project Specification Division Section 625—GCL, Page 4. Has the specified sheer and peel strengths been determined to be adequate to resist

damage during and after installation for the proposed design? See Comment 2. Please include this information in your responses.

Response: An analysis of the GCL has been included in Appendix C.

Comment 9. EPA's consultant concluded that the magnitude of displacements predicted by Hydrometrics' analysis and their analysis suggest adequate earthquake performance of the landfill cover. Please see the attached seismic analysis for further detail.

Response: Comment noted, and the seismic analysis performed by EPA's consultant has been added to Appendix C.



LANDFILL SECTION

NOT TO SCALE

DESIGN ANALYSIS REPORT ASARCO EAST HELENA PHASE 2 CORRECTIVE ACTION MANAGEMENT UNIT (CAMU)	**TYPICAL LANDFILL SECTION**	**FIGURE** **3-6**

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Hydrometrics, Inc.
Consulting Scientists and Engineers

The compacted clay liners are key components of the CAMU liner and cover systems and require careful material control. Material for construction of the liners is available from excavated materials on-site. As explained in Section 3.2, results from the geotechnical investigation indicate that site soil may not be suitable for use in construction of the compacted clay liner for the CAMU Phase 2 Cell therefore a geosynthetic clay liner (GCL) will be placed above the compacted clay liner to meet the hydraulic conductivity performance requirements. During site preparation and excavation, the sandier (low clay content) site soil will be segregated from the more clayey soil, which will be tested to confirm suitable gradation and plasticity before being used for construction of the CCL.

Testing will be conducted during construction to verify that soils excavated for use in construction of the compacted clay liner are suitable. EPA guidance (EPA, 1989) explains that to produce a protective CCL, the soil used for construction of the soil liner should have certain characteristics. First, it should have at least 20 percent fines. Second, it should have a plasticity index greater than 10. Third, it should be composed of no more than 10 percent gravel-size particles, and fourth, it should contain no soil particles larger than 1 or 2 inches in diameter. As discussed in the CAMU Phase 2 Cell Geotechnical Investigation (Hydrometrics, 2006), it should be possible to meet these standards with site soil if used selectively. First, site soil has between 58 and 71 percent fines. The average fraction of fines for the four samples tested is 65 percent, which is well above the standard of 20 percent. Second, the Plasticity Index (PI) for site soil ranges between 8 and 18 percent, with an average of 12 percent, which is greater than the standard of 10 percent contained in EPA guidance. Third, site soils range from less than 1 to 8 percent gravel. The average gravel fraction is much less than the standard of 10 percent required to be indicative of soil suitable for construction of a compacted clay liner. Finally, material specifications for the compacted clay liner have been written to prevent soil particles greater than 1 or 2 inches from being used to construct the liner, as suggested by EPA design guidance.

3.5 WASTE MATERIAL

Waste material that is to be placed in the CAMU will consist of demolition debris and waste soils from within the plant area and generated from RCRA corrective action projects. The major demolition debris waste material source areas and quantities are listed in Table 3-3.

3.7.1.2 Secondary Composite Liner

The secondary composite liner ensures that any leakage through the primary FML is collected by the leak detection, collection, and removal (LDCR) system and prevents migration of groundwater into the CAMU Phase 2 Cell. It consists of a 60-mil, double-sided textured HDPE FML, identical to the primary FML in design, underlain by a geosynthetic clay liner and 3 feet of compacted clay.

As discussed in Section 3.4.1, EPA has required that a GCL be included above the clay liner to ensure a permeability of 10^{-7} centimeters-per-second as required by 40 CFR 264 subpart N. The geosynthetic clay liner will be needle punch reinforced GCL comprised of a uniform layer of granular sodium bentonite encapsulated between a scrim reinforced non-woven and a virgin staple fiber non-woven geotextile. The needle-punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond. All seams must be overlapped a minimum of 12 inches and sealed with powdered bentonite sealing compound. Seams must be oriented parallel to the line of maximum slope. No horizontal seams should be allowed on the slopes.

3.7.1.3 Cap Composite Liner

This component of the CAMU Phase 2 Cell cap closes the CAMU Phase 2 Cell and prevents infiltration of precipitation. It consists of a 40-mil double-sided textured HDPE FML, underlain by a geosynthetic clay liner (GCL). The geosynthetic clay liner will be needle punch reinforced GCL comprised of a uniform layer of granular sodium bentonite encapsulated between a scrim reinforced non-woven and a virgin staple fiber non-woven geotextile. The needle-punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond. All seams must be overlapped a minimum of 12 inches and sealed with powdered bentonite sealing compound. Seams must be oriented parallel to the line of maximum slope. No horizontal seams should be allowed on the slopes.

An HDPE geomembrane was chosen for this FML to ensure that the permeability of the cap liner is no less than the cell liner system, as required by 40 CFR 264 subpart N. In addition to acting as a component of the composite liner, the GCL covering the waste material provides a smooth surface for installation of the cap FML and provides an additional factor of safety in preventing percolation through the cap.

3.7.2 Leachate Systems

The primary leachate collection and removal (PLCR) system and the leak detection, collection and removal (LDCR) system will be constructed of geocomposite materials with a minimum

per square foot of confining pressure, as required by the performance standards discussed in Section 2.3. The performance of the PLCR was checked using HELP 3 modeling, and found to prevent more than 12 inches of leachate from collecting above the primary liner, as shown in Table 3-6.

A geocomposite was selected as a drainage component primarily due to its economy when compared to a gravel layer. Perforated drainpipe embedded in a gravel drain layer has the advantage of common usage and design, but requires a minimum of 1 foot of cell depth. Geocomposites promote rapid transmission of liquids while requiring only 1/4 inch of cell depth. While the square-foot cost of geocomposite is comparable to drain gravel, the reduction in cell depth from use of the geocomposite in design resulted in major cost savings on the project.

The geocomposite drainage layer is laid on a 2 percent slope and drains to a collection trench along one edge of the CAMU Phase 2 Cell. The collection trench contains a corrugated HDPE perforated drain pipe enveloped in drain gravel. The corrugated HDPE perforated drain pipe collects leachate from the geocomposite layer and directs it to a sump consisting of a 24-inch diameter smooth HDPE pipe which extends vertically through the cap, allowing a submersible pump to be lowered in and out of the pipe for removal of any accumulated leachate. The 24-inch pipe will be embedded in a 12-inch thick concrete slab to provide structural support and a solid surface for pumping. Accordion style pipe boots will be used at all liner penetrations to provide a water tight seal and to relieve additional stress on the liner should settlement occur.

3.7.2.2 Leak Detection, Collection, and Removal (LDCR) System

This system is designed to detect and collect any leakage through the Primary FML within 24 hours. Another geocomposite layer was used for the LDCR for the same reasons discussed for the PLCR. In fact, the system is identical to the PLCR in design with the geonet used as a composite between two 8 oz. non-woven geotextiles. As for the PLCR, the geocomposite layer is sloped approximately 2 percent to a collection trench where leachate is directed to a sump for removal. Maximum travel time to the sump for this design is approximately three hours, which is less than the 24 hours required by performance standards. Appendix C contains this analysis.

3.7.3 Gas Collection System

This system is designed to collect and remove gas generated from the waste and consists of a series of 4-inch perforated corrugated HDPE pipes embedded in a 1-foot thick layer of ¼ -inch to ½-inch gravel. The piping directs the gas to one of five vent pipe risers located in the center and at each corner of the top of the cell. The vent pipe risers consist of 4-inch smooth HDPE pipe, which extend approximately 12-inches above the top of the cap. The risers will be shaped like a "candy cane" and will have screens over the open end of the pipe to prevent precipitation or objects from entering the pipe. Concrete collars will be place around the vent pipes for additional support.

3.7.4 Surface Water Collection and Removal (SWCR) System

This system allows surface precipitation to drain away from the surface of the Cap Composite Liner, and consists of a 1-foot thick layer of drain gravel on a 3 percent slope. This layer drains to a corrugated drain pipe embedded in a gravel-filled trench at the toe of the CAMU Phase 2 Cell cap slope. The drain pipe outlets to a shallow infiltration and evaporation pond adjacent to the CAMU Phase 2 Cell which prevents run-off from mixing with diverted run-on flows.

3.7.5 Cover System

This component provides frost protection to the cap composite liner and, after seeding, protects the surface of the CAMU Phase 2 Cell from erosion. It consists of 6-inches of seeded topsoil overlying 24-inches of subsoil. The project specifications require the organic rich topsoil to be salvaged and stockpiled separate from the underlying subsoil to ensure a proper medium for seeding with grasses. The combination of cover system and SWCR provides a total of 3.5-feet of frost protection to the cap composite liner. The CAMU cover has been designed with a top slope of 3 percent and fairly flat side slopes of 5:1 to resist erosion and minimize maintenance.

3.7.6 Groundwater Monitoring System

Finally, the CAMU Phase 2 Cell has been designed and will be constructed with monitoring systems that can detect a failure of the CAMU Phase 2 Cell. As described in section 3.5.2.2, the first line of detection takes place in the LDCR. A secondary line of monitoring, consisting of ten groundwater monitoring wells, has been constructed around the CAMU Phase 2 Cell site and will be monitored on a semi-annual basis. A statistical analysis of the data from this monitoring will detect any impacts to the groundwater quality associated with the CAMU Phase 2 Cell. The sampling and monitoring plan, contained in Appendix D of this report, establishes a detection monitoring program in compliance with 264 Subpart F requirements.

4.0 PLACEMENT OF WASTE SOILS, SEDIMENTS AND DEMOLITION DEBRIS IN CELL

Materials will be placed and compacted in the cell to minimize voids, settlement, and damage to the liners. Smelter demolition debris and waste soils will be placed and compacted in the cell in lifts not to exceed 2 feet thick across the bottom of the cell. A detailed Waste Hauling Plan can be found in Appendix E.

All materials delivered to the cell for placement will require some segregation. This will allow consolidation of the materials during compaction and will result in a homogeneous mass with a minimal amount of voids. Specifically, bulk concrete and metal debris will be broken or otherwise reduced in size not to exceed a vertical dimension of 2 feet in diameter. There are no horizontal or width dimension restrictions other than the debris must fit in a haul truck to be transported to the CAMU Phase 2 cell. All material requiring size reduction will be resized at the structure demolition site using excavators with concrete breakers or shears before being transported to the CAMU Phase 2 Cell. Large organic material (e.g. timbers) and manufactured metal will be placed horizontally in the cell as flat as possible to minimize voids. Special care will be taken near the sides and bottom of the cell to place crushed slag or a minus 1/2" gravel as a cushion layer to protect the liner systems against puncture. The project specifications require the contractor to use a 1/2" to 1/4" graded material as a protective layer (12-inches thick) adjacent to the bottom and sides of the cell and an additional 12-inches of minus 1/2" material over that. This material shall be free of oversized material and sharp objects.

A dust control program will be required to minimize the creation and spread of dust during the excavation, loading, hauling, placement and compaction activities.

The contractor shall be required to have readily available pumps capable of pumping 400 gallons per minute in the event of a significant rainfall event and shall provide a temporary 20-mil RPE Liner for the waste material placed in the CAMU Phase 2 Cell. Special care must be taken to ensure that the waste is covered prior to significant occurrences of precipitation. In addition, the Contractor shall ensure that the waste is placed in a manner that will ensure that the water which falls on the temporary liner will drain to a sump without coming in contact with the waste material and without significant ponding of the water on the temporary liner. The water reaching the sump shall immediately be discharged to the storm

5.0 TEMPORARY CLOSURE AND MONITORING

The construction of the CAMU Phase 2 Cell will begin in 2007. Once the cell is excavated and the liner, leak detection, and leachate collection systems are constructed the cell will be filled with waste materials from both 2006 and 2007 demolition work. Placement of waste materials generated from 2006 demolition work will free up containment building storage space that may be used to store waste materials generated from demolition work after temporary closure of the CAMU cell before the end of the 2007 construction season. By the end of the 2007 construction season, a temporary cap constructed from 20 mil Reinforced Polyethylene (RPE 25) with stitched z-fold seams will be placed over the waste, using sandbags to hold it in place. Prior to placement of the liner, the surface of the waste will be graded to drain, rolled smooth, and covered with a 10-ounce cushion fabric. Sandbags placed in a 5-foot grid will be installed to anchor the middle portion of the cap and edges will be anchored in trenches. The cell has been designed to contain 40,000 cubic yards of material in the excavated portion of the cell. This will allow the contractor to grade the waste material level with the existing ground surrounding the CAMU Phase 2 Cell which will help to promote runoff from the temporary cover. The temporary RPE 25 cap may also be used at the conclusion of subsequent construction seasons if it is stored carefully in between uses. However, the cushion fabric will need to be replaced. Freezing and wind and other weather related damage may limit the useful life of the temporary cap.

This temporary component of the CAMU Phase 2 Cell cap will help to reduce infiltration of precipitation into the waste material until final capping of the CAMU Phase 2 Cell is completed. If it is to be reused, the liner may be divided into small enough panels to remove from the CAMU and then reanchored with sandbags on adjacent land that is out of the way of construction. The liner will need to be inspected prior to reuse in order to insure that it is still in adequate condition for use. If it is determined that it is not in a sufficient condition to be reused, it will need to be well perforated so that it will not hold water, prior to placing it in the CAMU cell, or placed over the top of the waste material prior to capping the cell. The 10-ounce cushion fabric, which is not reusable, will be cut into pieces 36 square feet or smaller, placed flat and distributed evenly throughout the cell. The Operation and Maintenance Plan (O&M Plan) addresses temporary closure activities of the CAMU and is located in Appendix E.

8.0 REFERENCES

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40 CFR 258 Subpart B, Criteria for Municipal Solid Waste Landfills – Location Restrictions.

40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 270, EPA Administered Permit Programs: The Hazardous Waste Permit Program.

Administrative Rules of Montana

17.50.505, Standards for Solid Waste Management Facilities.

17.50.506, Design Criteria for Landfills.

APPENDIX C

DESIGN ANALYSIS

CHECK GCL LINER STRESS DURING SETTLEMENT

Installed Area of Liner = 208655.9762 sf

Installed Area of Liner After Settlement = 208731 sf

Strain, ε = (	208731 -	208656) sf /	208656 sf
ε_{actual}=	75.02382 sf /	208656 sf	
ε_{actual}=	0.00036 in/in		
ε_{actual}=	0.035956 %		
GCL grab elongation (ε_{allow})=	50 %	From Manufacturer	
FS($\varepsilon_{allow}/\varepsilon_{actual}$) =	1390.598 **OK**		

Conclusion: Settlement of the Phase 2 cell will have no detrimental effect on the GCL liner.

ANCHORAGE
Calculate anchor capacity for GCL placed in various anchorage configurations

Friction Angle	= δ_L =	25 ° to	30 °	use:	25 °
Soil f Angle	= ϕ =	25 ° to	38 °	use:	30 °
Slope Angle	= β =	18.43 °			
Soil Unit Wt	= γ =	100 pcf to	130 pcf	use:	130 pcf
Embedment	= L_H =	3 ft			
"V"Embedment	= L_V =	2 ft			
"V"Depth	= d_V =	1 ft			
Cover Depth	= d_c =	2 ft			
Anchor Burial	= d_{AT} =	1 ft			

1. Horizontal Embedment Anchor Figure 3-8[2]

T_H = Anchor Capacity

$T_H = (q \times L_H \times \tan(\delta_L)) / (1.5 \times \cos(\beta) - \sin(\beta)\tan(\delta_L))$

$q = \gamma \times d_c$

$= 130$ pcf x 2 ft

$= 260$ psf

$= ($ 260 psf x 3 ft x tan(25°)) / (1.5x cos (18.43

$=$ **285.1264 lb/ft** >= 256.8892 lb/ft **OK**

2. "V" Trench Figure 3-8[2]

T_V = Anchor Capacity

$$T_V = \frac{\tan(\delta_L)\,[\,q\,(L_H - L_V + L_V / \cos(i)) + (d_V \times L_V \times \gamma c / (2 \times \cos(i))]}{1.5 \times \cos(\beta) - \sin(\beta) \times \tan(\delta_L)}$$

$i = 45^\circ$

$T_V = \tan($ 25°) [260 psf (3 ft - 2

1.5cos(0°) - sin(0° x tan(0°)

$=$ **366.5921 lb/ft** >= 256.8892 lb/ft **OK**

3. Anchor Trench Figure 3-8[2] 2%

$$T_A = \frac{q \times L_H \times \tan(\delta_L) + (K' + K_A)\tan(\delta_L)(0.5 \times \gamma \times d_{AT}^2 + q \times d_{AT})}{1.5 \times \cos(\beta) - \sin(\beta) \times \tan(\delta)}$$

$T_{Ap} =$ 260 psf x 3 ft x tan(25°) + 3.33x tan(25

1.5cos(18.43°) - sin(18.43° x tan(25°)

$T_{Ap} =$ **680.7393 lb/ft** >= 256.8892 lb/ft **OK**

$T_{Ao} =$ 260 psf x 3 ft x tan(25°) + 0.833x tan(25

1.5cos(18.43°) - sin(18.43° x tan(25°)

$T_{Ao} =$ **384.089 lb/ft** >= 256.8892 lb/ft **OK**

[2] U.S. Environmental Protection Agency, "Requirements for Hazardous Waste Landfill Design, Construction, and Closure" (EPA/625/4-89/022), August 1989

ATTACHMENT 1

SEISMIC ANALYSIS

Tetra Tech EM Inc. (Tetra Tech) reviewed the April 10, 2007, calculation data sheets prepared by Hydrometrics Inc. Tetra Tech also performed an independent calculation of the approximate yield acceleration necessary to move a 1-foot square block of cover down an incline sloped at five horizontal to one vertical. This analysis calculated a yield acceleration of 0.11g, which compares favorably to the yield acceleration calculated by Hydrometrics of 0.104g.

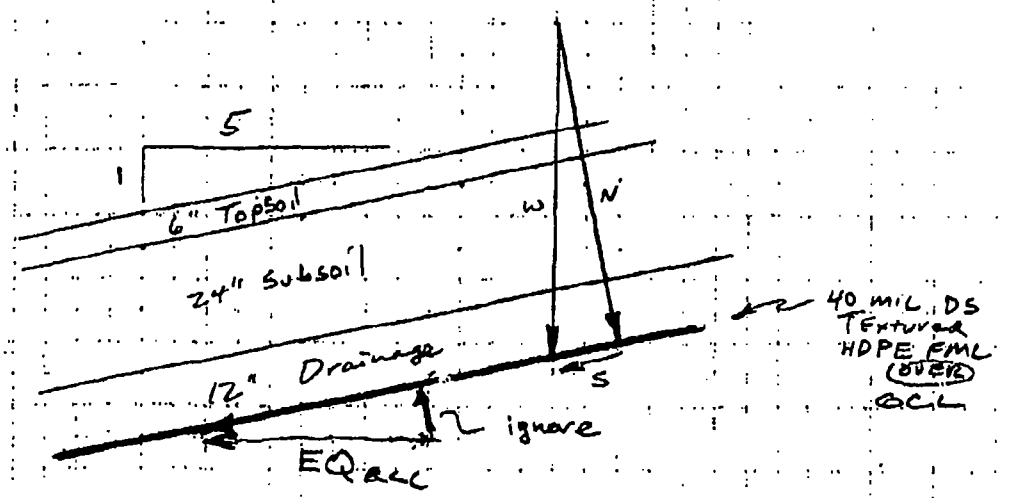
The output data sheets calculated by Hydrometrics indicate possible earthquake induced displacements on the order of 0.9 to 5.1 cm when subject to a magnitude 6.4 earthquake, with a peak ground acceleration of 0.30.

After entering the same earthquake magnitude and peak ground acceleration into a chart prepared by Makdisi and Seed (1977), a typical displacement of approximately 10 cm (4 inches) is read off of the chart (see attached). This presumes a friction angle of 17° using smooth HDPE (same as the Hydrometrics analysis). Hydrometrics correctly concludes that textured HDPE will offer greater resistance.

Hydrometrics, Inc., conducted their analysis using the USGS open file report 03-005, "Java programs for using Newmark's method and simplified decoupled analysis to model slope performance during earthquakes," 2003. The program models earthquake behavior and predicts movements in a more rigorous fashion. While the program output may or may not be more accurate than the less rigorous method used by Tetra Tech, we believe that the magnitude of displacements predicted by both methods suggest adequate earthquake performance of the landfill cover. Especially considering that a conservative friction angle was used for the smooth HDPE, when the project specified a textured HDPE.

REVIEW / INDEPENDANT CALC
NEWMARK ANALYSIS

415-222-8295
JOHN BECHE
5-30-07
CAMU REVIEW
JN1 69022.008014 0102
ASARCO - EAST HELENA
PLANT
PHASE II CELL PROJ



$\beta = \arctan \frac{1}{5} = 11.3°$

D A Cos

$W = (42"\ Soil) \times \frac{ft}{12"} \times 120 \frac{\#}{ft} = 420\ \#$

$u \times N$ = friction resistance

$\cos 11.3 = 0.98$

$N = 420$

$W = 420/.98 = 428$

$\sin 11.3 = \frac{S}{428} = 0.196$

$S = 84$

$\tan 17° = u_s = 0.306$

$m = \frac{428\ \# - S^2}{32.2\ ft} = 13.3\ slug$

$F_y = m a_y$

$u_s \times N = S + F_y = S + m\, a_y$

$a_y (m) = u_s \times N - S$

$a_y = \frac{.306(428) - 84}{13.3} = \frac{125-82}{13} = 3.5 \frac{ft}{s^2} = 0.11\ g$

Permanent Displacement

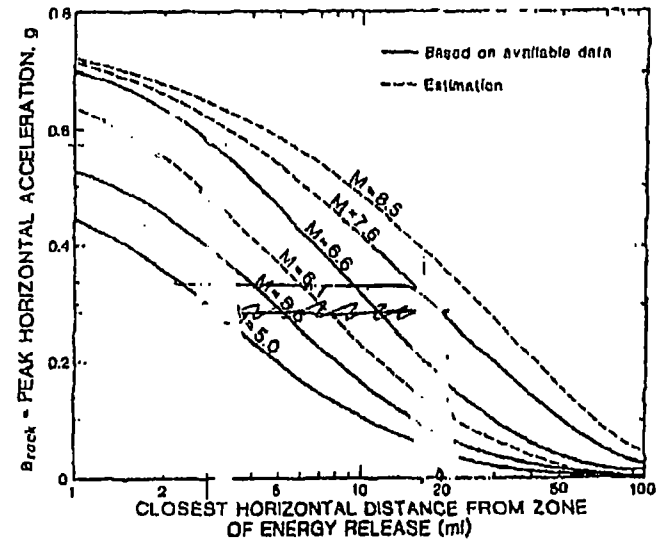


Figure 10.22 Average values of maximum accelerations in rock. (From Seed and Idriss, 1982. Reproduced by permission of Earthquakes Engineering Research Institute.)

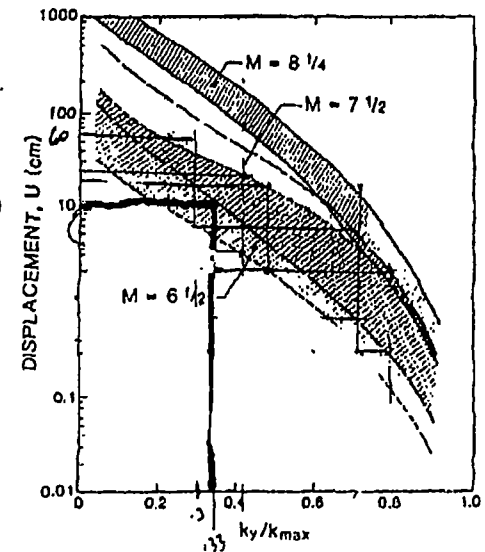


Figure 10.23 Variation of permanent displacement with yield acceleration. (From Makdisi and Seed, 1977.)

$K_y = 0.11$
$K_m = 0.3$

Ratio = 1/3

Displacement = Approx = 10 cm = 4 inches

APPENDIX E

CORRECTIVE ACTION MANAGEMENT UNIT OPERATING PLAN

APPENDIX E

OPERATING PLAN
ASARCO EAST HELENA
CORRECTIVE ACTION MANAGEMENT UNIT (CAMU)

Prepared for:

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P.O. Box 1230
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Prepared by:

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February 2007
Revised May 2007
Revised June 2007

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APPENDIX E

OPERATING PLAN
ASARCO EAST HELENA
CORRECTIVE ACTION MANAGEMENT UNIT (CAMU)

1.0 GENERAL INFORMATION

This plan addresses care, operation, monitoring, and maintenance of the Corrective Action Management Unit (CAMU) and is included as Appendix E of the Design Analysis Report Asarco East Helena Corrective Action Management Unit (CAMU) Phase 2 Cell. The CAMU is located adjacent to the Asarco East Helena Plant, and south of the community of East Helena, Montana. In 2001 a waste containment facility, known as the CAMU Phase 1 Cell, was constructed for the disposal of soils, sediments and demolition debris resulting primarily from smelter site remedial cleanup activities. In 2007, a second waste containment facility, known as the CAMU Phase 2 Cell, will be constructed adjacent to the Phase 1 Cell, and will contain demolition debris and waste soils from current remedial cleanup activities. Although not required by CAMU regulations, the Phase 1 and Phase 2 Cell were designed to comply with the Resource Conservation and Recovery Act (RCRA), Subtitle C regulations and guidelines.

1.1 PURPOSE

The purpose of this Operation Plan is to present guidelines for care, operation, monitoring, and maintenance of the CAMU to fulfill the intent of the remediation activities implemented in response to the implementation of the RCRA Consent Decree (CV98-3-H-CCL). This Operation, Maintenance, Waste Hauling, and Post-Closure Plan establishes specific criteria and response timelines for repair for each inspection element, including notification provisions of required repairs to regulatory agencies; as well as, provides insight and guidance into the

measures that will be implemented to properly transport hazardous waste materials from the Asarco East Helena Smelter site to the Corrective Action Management Unit (CAMU) Phase II Cell. This plan complies with all applicable requirements specified in the Code of Federal Regulations, Title 40, Part 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264). This Operation, Maintenance, Waste Hauling, and Post-Closure Plan provides:

1. Basic construction information;
2. A description of all required site inspection and monitoring activities, including the frequency with which each activity will be performed and the corrective actions that will be taken for each problem encountered;
3. A description of all required site maintenance activities, including the frequency with which each activity will be performed;
4. Contact information during the post-closure period;
5. A description of the planned land uses during the post-closure care period; and
6. Financial assurance during the post-closure period.

In addition, this plan minimizes the need for facility maintenance after the site is closed and controls, minimizes, or eliminates to the extent necessary protection of human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground, surface waters, or atmosphere. This plan also minimizes the risk to both the environment and human health by addressing the means and methods that will be utilized to implement dust control measures, maintain equipment, and sustain clean work and road surfaces.

1.2 RESPONSIBILITY

Asarco LLC is responsible for implementation of this plan. Asarco LLC is referred to as the owner/operator throughout this plan.

1.3 COMMUNICATIONS

Lines of communication between the contractor, inspectors, and ASARCO will be established before construction of the CAMU cell begins. All communications, inspection logs, and incurred problems shall be documented and copies provided to the owner/operator.

1.4 OPERATING LOG

Asarco LLC will maintain an operating record of all site inspections and maintenance activities as required under 40 CFR 264.73. Communications between the contractor, inspectors, and the owner should be documented and kept as part of the operation log.

1.5 PUBLIC SAFETY AND HEALTH

The CAMU Phase 1 Cell has been closed and is secured by fencing. Like the Phase 1 Cell, the Phase 2 Cell will be fenced and kept secured to control public access to the site. Once the Phase 2 Cell has been closed, the site will pose no special public safety or health hazards. The contractor will be responsible for ensuring that the site is secure and gates and fences will be inspected weekly to keep the site secure.

2.0 CONSTRUCTION INFORMATION

The CAMU Phase 2 Cell consists of the following components listed in order from the bottom to the top of the cap:

1. Secondary Composite Liner
   - 3-foot compacted clay liner (CCL)
   - Reinforced GCL liner
   - 60-mil Double Sided Textured HDPE flexible membrane liner (FML)
2. Leak Detection, Collection, and Removal System
   - Geocomposite Drainage Layer
3. Primary Liner
   - 60-mil Double Sided Textured HDPE flexible membrane liner (FML)
4. Primary Leachate Collection and Removal (PLCR) System
   - Geocomposite Drainage Layer
5. 2-foot Cushion Layer
6. Waste
7. 12-inch Gas Migration Layer
8. Cap Composite Liner
   - Reinforced GCL
   - 40-mil Double Textured HDPE flexible membrane liner
   - Geocomposite
9. Surface Water Collection and Removal (SWCR) System
   - 1-foot thick drainage gravel layer
10. Cover System
    - 2-feet cover soil
    - 6-inches topsoil and
    - Grass cover.

3.0 WASTE HAULING AND DUST CONTROL

Waste Hauling and dust control measures are designed to control the emission of visible fugitive dust. These controls will be accomplished through the use of administrative, engineering, and physical controls. The mitigation of airborne dust generation is considered to be a priority. Throughout the project, the necessary steps will be taken to effectively control dust in the working area during demolition operations. The use of minimum amounts of water will be the main source for dust control. All communications between the contractor, inspectors, and ASARCO should be documented.

3.1 ON-SITE TRANSPORT

Sorting and sizing of demolition debris will occur at the demolition site prior to being loaded in haul trucks. All oversized materials will be reduced at the demolition site and once the debris and material is loaded into haul trucks, no further reduction of materials will be necessary. After demolition debris is loaded into the truck beds, the debris payload will be moistened prior to the vehicle leaving the loading area. The truck beds will utilize sealed tail gates. The use of truck bed covers may be considered if the physical shape of the truck beds accommodate. Transport vehicles will be limited to a maximum of 10 miles per hour while transporting waste across the plant site. Limiting speeds will prevent dust from become airborne during transport and will prevent the kick-up of dust from rolling tire action.

3.2 OFF-SITE PREPARATION AND TRANSPORT

Prior to debris leaving the Asarco Smelter site and being transported to the CAMU, transport vehicles will be run through a scale, sampling station, and moistening station. The haul truck will be weighed on the scale and a sample will be taken from the trucks payload at the interval specified in Attachment C of this Appendix - Sampling and Analysis Plan. The moistening station will consist of a scaffolding platform on which personnel will mist water on the loaded debris as a final step before it travels outside the property fence line and across the County road. The spray will add a final moisture barrier/binder to the debris for the short distance haul to the CAMU. Transport vehicles will be limited to a maximum of 10 miles

per hour during transport. Limiting speeds will prevent dust from become airborne during transport and will prevent the kick-up of from rolling tire action.

3.3 PLACEMENT OF WASTE

Once haul trucks arrive at the CAMU Phase II cell, they will drive into the cell and dump their load in the location specified by the contractor. Asbestos materials are the only materials with a designated location in the CAMU cell and will be placed in this location as directed by the contractor. A water truck will be located close to the CAMU cell to lightly mist debris and knock down any dust during the dumping and spreading phase of the debris in the CAMU. Use of water will be kept to a minimum. Additional water will be applied to locations in the CAMU to eliminate the potential for fugitive dust emissions. Waste will be placed in the CAMU cell in two-foot lifts and compacted according to Project Specifications. Inspections of the CAMU cell will occur at least twice daily to assess the potential for windblown dispersion of fugitive dust. Water will be applied to areas of the cell where fugitive dust could potentially or is found to be a problem.

3.4 CONTINGENCY PLAN

If the CAMU is not immediately available for waste placement, CAMU destine-waste will be transported to and staged inside designated facilities that meet 40 CFR 265 Subpart DD, Containment Building requirements. Waste material will be transported as previously described and will be dumped into bulk stockpiles. The designated facilities will provide protection from weather, specifically wind and rain. Therefore, inside the facilities, materials will not be covered and dust mitigation will not be necessary. Once the CAMU is ready to accept material, stockpiled waste will be transported from the designated facilities to the CAMU as previously described.

3.5 WASTES REQUIRING SPECIAL MANAGEMENT

Wastes requiring special management include; asbestos, flue dust, and acidic waste. Proper procedures for pretreatment and packaging these wastes will be conducted in the demolition areas prior to the materials being loaded on haul trucks. Acidic waste will be neutralized

using lime rock and loaded into haul trucks and hauled to the CAMU cell. Asbestos containing products and flue dust will be handled according to the procedures outlined in Sections 5.0 and 6.0 of the Blast Furnace Flue and Monier Flue Cleaning, Demolition, and Soil Sampling Work Plan (Asarco 2007). These procedures outlined in Sections 5.0 and 6.0 are included as Attachment A. All Friable asbestos that is wrapped and contained, will be loaded, transported, and placed in the southwest corner of the CAMU cell in such a manner that the integrity of the wrapping is not breached. Once the material has been placed in the cell, its location will be surveyed and then covered with soil to maintain the integrity of the wrapping. The location of the asbestos containing material will be shown on the as-built drawings of the CAMU Phase 2 Cell and this drawing will be included in the deed restriction. At no time will friable material be exposed to the environment. Non-friable asbestos waste will be loaded and transported as described above for general demolition debris.

3.6 WORK STOPPAGE

Work shall halt when weather conditions are such that the spread of contaminated dust and debris is likely. These conditions typically exist when there is excessive wind and/or rain. Therefore, if wind with sustained readings of 15 MPH (average hourly rate) or more evolve, the handling and hauling of waste both on-site and off-site will halt to prevent dust and debris from becoming airborne due to the waste management process. Sustained wind speeds will be monitored by management personnel through the use of a calibrated on-site wind sock; as well as, through data provided by the National Oceanic and Atmospheric Administration (NOAA) at www.noaa.gov for wind speeds at the Helena Airport. Furthermore, if a rain event begins, management personnel will evaluate the site conditions. If the rain is such that no run-off is occurring, work activities will proceed uninhibited. In the event that the rain is of such volume that run-off is beginning to occur and the work activities in progress (i.e., waste hauling, placement of waste in CAMU) could create a contaminated run-off, both on-site and off-site work will cease until such time that a run-off potential is not present. The contractor will evaluate these conditions with ASARCO representatives. In the event that

transport is halted, no additional trucks will be loaded and any trucks containing wastes will be covered until conditions improve.

3.7 DECONTAMINATION AND INSPECTION OF EQUIPMENT

Equipment used in the handling and/or transport of demolition debris will be decontaminated prior to the equipment leaving the site, or moving from a demolition zone to an area considered clean. Decontamination pads, a concrete slab suitable for placement of heavy equipment, will be established, in areas agreed upon with and approved by ASARCO representatives. The location of the decontamination pads may change as demolition activities progress. However, all equipment will be decontaminated within close proximity to where it will leave the Asarco Smelter site. Equipment that has been decontaminated will be inspected upon completion to ensure the adequacy of the process and to document the process to ensure quality control prior to the transport vehicle leaving the site.

Decontamination will consist of one or a combination of the following: brushing, vacuuming, or washing methods. The goal of the decontamination is to remove heavy metal laden bearing dust and debris from the areas of the equipment that came into contact with this waste. Upon completion of the decontamination activities, any removed dust and debris residue will be picked up and placed into storage for eventual placement into the CAMU.

Haul trucks leaving the CAMU Phase II cell will be traveling on paved haul roads and will not be decontaminated until they enter the ASARCO smelter facility, where they will be decontaminated on one of the decontamination pads. Any large debris will be knocked off of haul trucks as they leave the CAMU cell. The section of haul road between the CAMU cell and the ASARCO smelter facility will be constantly monitored and swept on a regular basis. This section of haul road will be inspected twice daily.

Transport vehicles will be inspected periodically to ensure that truck beds and gates are properly sealed and that debris is not building up. Full decontamination of vehicles that are leaving the Asarco site should be run periodically.

Equipment used in the CAMU cell for spreading and compacting waste will be decontaminated at the ASARCO smelter facility. This equipment will be placed on trailers and driven via the haul road back to the ASARCO smelter facility, where it will be decontaminated on one of the decontamination pads.

3.7.1 Work and Road Surface Cleaning

Haul roads within the plant site and haul roads used for waste transport will need to be kept clean at all times. A street sweeper designated to cleaning roads and surfaces within the plant site will clean up all loose dust in order to minimize the chances for the off-site migration of dust and debris. This street sweeper will not be used off site of the plant. A second street sweeper designated to keeping CAMU haul roads clean will be run constantly when waste is being hauled. Haul roads will be paved so that waste and debris can easily be cleaned. This will allow for daily visual inspection of haul roads to make sure transport vehicles are being adequately decontaminated and waste is adequately moistened.

3.8 SPILL MITIGATION

Spills of soils or debris being transported to the CAMU will be prevented by constant maintenance of trucks to make sure they are properly sealed and in good working order. In addition, traffic control and slow truck speeds, as previously mentioned will help to prevent accidents from occurring. If waste is spilled in route to the CAMU, the hauling of waste will halt and the spilled waste will be cleaned up using clean decontaminated equipment. If the spill occurs on the haul road, the road will be swept clean. If the spill occurs on soils, follow up soil sampling will be conducted to assure that all the contaminated waste has been cleaned up.

The inspection of the area surrounding the CAMU cell twice daily, will include looking for visible fugitive emissions. If a release from the cell is noticed during an inspection, the waste will be cleaned up using clean decontaminated equipment and placed in the CAMU cell. Excavation of soils where visible waste is noticed will be conducted immediately. Follow up soil sampling will be conducted to assure that all the contaminated waste has been cleaned up.

4.0 SURVEYING AND RECORDKEEPING

The owner/operator will follow surveying and recordkeeping regulations in accordance with 40 CFR 264.309. The owner/operator will establish a permanent surveyed benchmark, which will be placed on the top of the CAMU Phase 2 Cell once the final cap is complete. The owner/operator will also establish a permanent surveyed benchmark, on the top of the CAMU Phase 1 Cell. After the permanent surveyed benchmark is established, the owner/operator will publish a map to be kept on file in the operating record, which includes the exact location and dimensions, including depth of the cell. The owner/operator will also keep a list of the contents of the cell and the approximate location of each hazardous waste type within the cell.

6.0 SITE MONITORING AND INSPECTION

Inspections will be performed twice daily of areas surrounding the CAMU cell and the haul road between the CAMU and ASARCO smelter facility when the CAMU cell is in operation. Daily inspections of the road used for hauling waste will occur when the haul road is in use. While the CAMU cell is in operation it will be inspected once per week. Quarterly monitoring of groundwater quality and semi-annual site inspections will ensure that public health and safety are maintained at the site. Monitoring and inspection protocol are in accordance with 40 CFR 264.303.

6.1 SITE INSPECTIONS – OPERATION

6.1.1 Daily Inspections

While the landfill is in operation, inspection of the grounds surrounding the CAMU should be inspected twice daily. These inspections should include an assessment of the potential for windblown dispersion of fugitive dust from the CAMU and a visual inspection of the grounds surrounding the CAMU for any visible releases of fugitive dust from the CAMU cell. The haul route used by trucks leaving the CAMU and returning to the ASARCO smelter facility should also be inspected twice daily to ensure that it remains clean and free of dust and debris. The remainder of the haul road should be inspected once per day to ensure that it is free of dust and debris. Daily inspections should be documented and recorded on the Daily Inspection Form included in Attachment B of this Appendix and any problems found will be reported to the project manager and addressed immediately.

6.1.2 Weekly Inspections

While the landfill is in operation, it must be inspected weekly and after significant storms to detect evidence of any deterioration, malfunctions, or improper operation of run-on and runoff control systems, and the proper functioning of or presence of liquids in the leachate collection and leak detection system. When in use, the temporary liner cover that is used between construction seasons prior to permanent closure of the Phase 2 Cell will be examined for signs of damage and seam separation. Anchor trenches around the perimeter of

the cover will be inspected for liner pullout. Sandbags will be inspected for proper spacing and damage. The temporary liner that will cap the CAMU Phase 2 Cell between construction seasons will be fenced and kept secured to help ensure the cap is not disturbed by people or large animals. Inspection of the perimeter fence, gates, condition of haul roads, condition of storm water pond, presence of precipitation run-off or ponded liquids, condition of decontamination pads, and the condition of haul trucks will be included in weekly inspections and any maintenance needed will be recorded on the Weekly Inspection Form included in Attachment B of this Appendix and addressed appropriately.

6.2 GROUNDWATER MONITORING

Groundwater monitoring will be accomplished in accordance with Appendix D – Sampling and Monitoring Plan. During quarterly groundwater monitoring events, components of the groundwater monitoring system will be visually inspected to ensure good working order. All inspections will be documented on the Inspection/Repair form included in Appendix D and included in the annual report. If any problems with the groundwater monitoring system are encountered, they will be documented on the Inspection/Repair form and the owner/operator will be notified within 24 hours. The owner/operator is responsible for making sure all repairs are scheduled and completed within 14-calendar days of the inspection. Details of completed repairs will be noted on the Inspection/Repair form. The owner/operator is also responsible for reporting any significant issues to the EPA representative verbally within 7-calendar days and in writing within 14-calendar days.

6.3 LEACHATE COLLECTION AND LEAK DETECTION SYSTEM MONITORING

The monitoring and maintenance of the CAMU Phase 2 Cell leachate collection and leak detection system will be conducted in compliance with 40 CFR 264.303. The pump used to remove liquids from the sumps will be capable of removing all but the last two feet of liquids from each sump. Therefore, the Pump Operating Level is defined as two feet of liquids in the sumps, which minimizes the head in the sumps and avoids backup into the drainage layer. The owner/operator will record pre- and post-pumping water levels and the amount of liquids removed from the leachate collection and leak detection system sumps once a week during

the active life and closure period. After the final cover is installed, pre- and post-pumping water levels will be recorded and liquids will be removed from the leachate collection and leak detection system sumps monthly. The amount of liquids removed will be recorded on the CAMU inspection form (Attachment B). If the liquid level in the sump stays below the pump operating level for two consecutive months, the amount of liquids in the sumps will be recorded quarterly. If the liquid level in the sump stays below the pump operating level for two consecutive quarters, the amount of liquids in the sumps will be recorded semi-annually. If at any time during the post-closure care period the pump operating level is exceeded at units on quarterly or semi-annual recording schedules, the owner/operator must return to monthly water level recording and liquids removal from each sump until the liquid level again stays below the pump operating level for two consecutive months.

Experience with the CAMU Phase I Cell indicates that it is not possible to establish an Action Leakage Rate within the first five years of the post-closure period. This is due to the fact that it is not possible to determine the volume of leachate removed from leakage through the impounded material from the volume of water that entered the drainage system during construction and was not able to be removed. According to EPA guidance (Survey of Technologies for Monitoring Containment Liners and Covers, 2004) leachate levels generally fall to a negligible level in 10 years or less. Therefore, an Action Removal Rate for the CAMU Phase 2 Cell will be established as soon as enough removal data is collected within the first 10 years of the post-closure period. Action Leakage Rate and leachate collection volumes will be presented as an average daily flow rate (40 CFR 264.302) in the annual inspection report. Once the Action Leakage Rate is established, the Response Action Plan, outlined in Section 3.5.1, will be followed if the Action Leakage Rate is exceeded.

Until an action leakage rate is established, the owner/operator will insure that the depth of leachate does not exceed 12-inches over the primary and secondary liners, by keeping the depth of the leachate to less than 5-feet in the 4-foot deep sumps of the leachate collection and leak detection systems. If the water level in either vertical standpipe exceeds 5-feet, the

5.0 CLOSURE PLAN

This plan identifies the steps necessary to perform partial and or final closure of the facility at any point during the cells active life. Partial closure will be necessary when the placement of materials is halted for the construction season and the temporary cap is placed over the cell. Final closure will be completed when all waste has been placed in the CAMU and the cell is ready for the permanent cover. The CAMU Cell will be closed in accordance with 40 CFR 264.111. The final cell cover has been designed and will be constructed to comply with 40 CFR 264.310.

5.1 CLOSURE ACTIVITIES

Before both partial closure and final closure of the CAMU cell, equipment used for placement of wastes inside the CAMU will be moved at speeds of less than 10 miles per hour to the Asarco East Helena Smelter facility where they will be thoroughly decontaminated at the facility equipment wash station. The haul road used to move contaminated pieces of equipment will be thoroughly swept after transport is complete to ensure that closure meets the closure performance standard. Soils testing will be conducted in soils surrounding the CAMU cell once the final cover has been placed on the cell, to ensure that the closure of the cell meets the closure performance standard. Other activities including groundwater monitoring, leachate collection and leak detection monitoring, and run-on and runoff control will be monitored as outlined in Section 3.0 during the closure period.

5.2 CLOSURE SCHEDULE

It may take approximately three construction seasons of cleaning and demolition at the Asarco East Helena Smelter facility before all waste is placed in the CAMU Phase 2 Cell and the cell is ready for closure. Upon final receipt of waste to the cell, it should take approximately 90 days to place the final cover.

5.3 NOTIFICATION OF PARTIAL CLOSURE AND FINAL CLOSURE

In accordance with 40 CFR 264.112(d), the owner/operator will notify the EPA regional administrator in writing at least 60 days prior to the date on which the cell is expected to begin closure. The closure date must be no later than 30 days after the date on which the cell receives the known final volume of waste, or if there is a reasonable possibility that the cell will receive additional waste, no later than one year after the date on which the cell received the most recent volume of waste. Within 60 days of completion of final closure, the owner/ operator will submit to the EPA regional administrator, by registered mail, a certification that the CAMU cell has been closed in accordance with all specifications. The certificate must be signed by the owner/operator and by a qualified Professional Engineer.

5.4 SURVEY PLAT

In compliance with 40 CFR 264.116, the owner/operator will submit to the local zoning authority, or authority with jurisdiction over local land use, and to the EPA regional administrator, a survey plat indicating the location and dimensions of the cell with respect to permanently surveyed benchmarks no later than 60 days after completion of final closure. This plat will be prepared by a professional land surveyor. The plat filed will contain a note, prominently displayed, which states the owner's/operator's obligation to restrict disturbance of the cell in accordance with 40 CFR 264 – Subpart G regulations.

sump will be pumped immediately and the Response Action Plan, outlined in Section 3.5.1 will be followed.

6.4 SITE INSPECTION – POST-CLOSURE

Periodic inspections are essential to ensure that the cover systems are performing adequately and to identify problems and provide proper maintenance of cover systems. The inspection program will involve three types of inspections: (1) monthly informal inspections, (2) semi-annual technical inspections, and (3) special inspections after extreme events.

6.4.1 Monthly Informal Inspections

The informal inspections will be a continuing effort by on-site personnel, performed in the course of their normal duties but no less than once a month. Education of new personnel will assure the continued effectiveness of these inspections. These inspections will be documented on the CAMU inspection form (Attachment B) and will be concurrent with pumping of the leachate collection and leak detection systems, unless pumping activities are performed on a quarterly or semi-annual basis.

6.4.2 Semi-Annual Technical Inspections

Semi-annual site inspections during the post-closure care period will include in-depth inspections of:

1. Leachate collection and Leak detection system;
2. Final cover system; and
3. Stormwater control systems.

A professional engineer familiar with the design and construction of the cover systems will perform every other semi-annual technical inspection. The semi-annual technical inspections will document settling and subsidence, erosion, membrane liner damage, status of the stormwater control system, and the cap's vegetative state. The inspection will ensure that the site stays in compliance with 40 CFR 264.280. These inspections will be documented and an annual report will be completed and submitted to the EPA.

6.4.3 Special Inspections After Extreme Events

A professional engineer familiar with the design and construction of the cover systems will also perform Special Inspections after extreme events. The inspection will ensure that the site is in compliance with 40 CFR 264.280. These inspections will be comprehensive and very similar to semi-annual technical inspections and will be performed after extreme events such as rare rain storms, winds, or earthquakes. These inspections will be documented and a Special Inspections report will be completed and submitted to the EPA separate from the annual inspection report.

6.4.4 Semi-Annual and Special Inspection Procedures

The inspection of the cover systems will typically involve walking the entire site in a systematic fashion that ensures the entire site is inspected. A checklist and site map will be used during inspections to aid in the process and are included as Attachment B. The inspection checklists contained in Attachment B, include the following items to be monitored and recorded:

1. Settlement or subsidence - Inspections will focus on looking for areas of localized settlement, sink holes, ponding water, cracking of cover soils, and any other signs that may indicated cover subsidence. The approximate depth of ponded water or depression, the limits of the affected area, and other pertinent details will be recorded for each inspection. The problem areas will be monitored to determine how the problem develops over time. This will help in evaluating the need for further investigation or repairs and help with planning repair strategies.

2. Erosion - Any evidence of erosion should be a cause of concern. The inspector will be especially observant along steeper slopes, drainage ditches, areas of vegetative stress, and any areas previously troubled by erosion problems.

3. Membrane liner damage - Excessive subsidence or vehicle traffic, such as mowing, on the cover may cause damage to the membrane liner. Unless visibly evident, membrane liner damage may be difficult to detect. Any areas on permanent caps

where the synthetic materials are exposed will be noted and a repair plan will be developed without delay.

4. Stormwater Control System - The run-on and runoff stormwater control system needs to be kept clear of all debris. Any evidence of erosion should be noted. The inspector will be especially observant of any subsidence of run-on dikes, the silting or filling in of runoff controls and obstructions that would have the potential to block water flow.

5. Cap's Vegetative State - Grass or plants with shallow root systems will be selected for the vegetated cover on the permanent caps and burrowing animals will be kept off the site. Areas where grasses are poorly established will be examined to determine the cause of the problem. The inspector will look for signs of excessive wetness or dryness, pest infestations, seepage, rodents, weeds, insufficient depth of topsoil, and other conditions that may inhibit healthy growth of the cover vegetation.

6. Perimeter Security - The permanent protective caps overlying the CAMU Phase 2 Cell will be fenced and kept secured to help ensure the cap is not disturbed by people or large animals. Inspection of the perimeter fence will be included in the periodic monthly inspections and any maintenance needed to insure a secure site will be recorded and addressed.

6.5 CORRECTIVE ACTION FOR IDENTIFIED PROBLEMS

If any problem or deficiency is found during any inspection type the following procedures will be followed. The inspector will record the location on a field sketch and will record a complete description of the affected area, including all pertinent data (i.e., size of the area and other descriptive remarks such as exposed synthetic materials, and odors, etc.) on the appropriate reporting forms. An accurate and detailed description of observed conditions will enable a meaningful comparison of conditions observed at different times. This information has three elements:

1. Location - The location of any questionable area or condition will be accurately described so that the area or condition can be evaluated for changes over time, repaired, or reexamined by experts.

2. Extent or Area - The length, width, and depth or height of any suspected problem area will be measured.

3. Descriptive Detail - A brief, but detailed description of the anomalous condition will be given.

Photographs are helpful in documenting problems. The owner/operator will keep a photographic log of problems, repairs, and general site conditions. This log will provide valuable information when evaluating the long-term performance of the cover system and when planning repair strategies.

If any problems are encountered during routine inspections, they will be documented on the Inspection/Repair form and the owner/operator will be notified within 24 hours. The owner/operator is responsible for making sure all repairs are scheduled and/or completed within 14-calendar days of the inspection. Details of completed repairs will be noted on the Inspection/Repair form. The owner/operator is also responsible for reporting any significant issues to the EPA representative verbally within 7-calendar days and in writing within 14-calendar days.

6.5.1 Response Action Plan

The Response Action Plan sets forth the actions to be taken if the action leakage rate has been exceeded or if an action leakage rate has not been established, the depth of leachate does not exceed 12-inches over the primary and secondary liners. The Response Action Plan is in accordance with 40 CFR 264.304. The actions to be taken include:

- Notifying the EPA regional administrator in writing of the exceedance within 7 days of the determination;

- Submitting a preliminary written assessment to the EPA regional administrator within 14 days of the determination, as to the amount of liquids, likely sources of liquids, possible location, size, and cause of any leaks, and short-term actions taken and planned;
- Determination to the extent practicable the location, size, and cause of any leak;
- Determine, when CAMU is in operation, whether waste receipt should cease or be curtailed, whether any waste should be removed from the unit for inspection, repairs, or controls, and whether or not the unit should be closed; and
- Determine any short-term and longer-term actions to be taken to mitigate or stop any leaks.

Within 30 days after the notification that the action leakage rate or depth of leachate has been exceeded, the results of the analysis specified above, the results of actions taken, and the actions planned must be submitted to the EPA regional administrator. Monthly thereafter, as long as the action leakage rate or depth of leachate is still exceeded, the owner/operator must submit the EPA regional administrator a report summarizing the results of any remedial actions taken and actions planned. To make the leak and or remediation determinations specified above, the owner/operator must assess the source of liquids and amount of liquids by source or document why such assessments are not needed. Assessing the source of liquids and amount of liquids by source includes conducting a fingerprint, hazardous constituent, or other analyses of the liquids in the leak detection system to identify the source of liquids and possible location of any leaks, the hazard and mobility of the liquid, and assessing the seriousness of any leaks in terms of potential for escaping into the environment.

7.0 SITE MAINTENANCE

7.1 GENERAL

This section provides guidelines to aid the CAMU operator in instituting and understanding the need for an effective maintenance program. The objectives of such a maintenance program are to:

1. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;
2. Ensure reliability of operation and limit environmental impacts;
3. Protect and extend the useful life of the CAMU Cell structure; and
4. Ensure public health and safety.

7.1.1 Importance of Maintenance

The CAMU Phase 2 Cell structure represents a substantial investment to protect the public health and environment of the areas surrounding the Asarco East Helena Smelter. One of the important factors to minimizing environmental impacts resulting from the site is a sound maintenance program. A sound maintenance program has the added benefit of identifying problems before they become emergencies.

7.1.2 Types of Maintenance

As shown in Table 4-1, there are four types of maintenance listed by priority rather than by frequency. Table 4-1 is provided as a guide to help put the types of maintenance into proper perspective. The different types of maintenance are also discussed in the following subsections.

TABLE 7-1. PRIORITY OF MAINTENANCE TASKS

Priority	Type of Maintenance	Description and Example
1	Emergency	A situation requiring immediate attention (for example, fire, earthquake, or flood).
2	Preventative	Scheduled inspection and minor repairs carried out during inspection (for example, cleaning of gutters and culverts).
3	Corrective	Corrective maintenance required as a direct result of scheduled inspection (for example, repair of torn membrane liner).
4	Housekeeping	Routine housekeeping of buildings and grounds (for example, mowing grass, painting, and general housekeeping).

1. Emergency maintenance - Emergencies are situations arising unexpectedly that require urgent attention. Often, immediate response must be provided to avert potential serious damage. Provisions for emergency repair/damage control activities and an Emergency Contacts list will be prepared and kept current with a list of phone numbers for local emergency response organizations, lining contractors, and agency and owner representatives. Table 4-2 provides a list of Emergency Contacts.

2. Preventative maintenance - Preventative maintenance is work done to extend the life of equipment and structures. With the exception of routine surveillance and inspections, preventative maintenance tasks will be scheduled in accordance with the recommendations of the material and equipment manufacturers. Scheduled inspection and maintenance of all site facilities will help ensure that potential problems are discovered and corrected before they become serious, as well as providing for the performance of periodically required upkeep. During routine inspections, the property managers will be alerted for any abnormal conditions, which could indicate potential problems.

TABLE 7-2. EMERGENCY NOTIFICATION CONTACTS AND PHONE NUMBERS

General Emergency Numbers:

Fire Department	911
Ambulance	911
Police	911

Corporate Resources

Asarco LLC:

Jon Nickel	(East Helena)	(406) 227- 4529
Blaine Cox	(East Helena)	(406) 227-4098

Other Resources:

Hydrometrics, Inc.	(Helena)	(406) 443-4150
U.S. EPA (24-hour emergency)		(206) 553-1263
Superfund/RCRA Hotline		(800) 424-9346

3. Corrective maintenance - Corrective maintenance is the work required for repairs and other non-routine maintenance. The CAMU owner/operator will handle these tasks as the need arises. Corrective maintenance procedures will follow the equipment or material manufacturer's recommendations. In planning for the corrective maintenance, the CAMU owner/operator will arrange for advice or assistance from an engineer or manufacturer's representative.

4. Housekeeping - Maintaining well-kept site closure facilities indicate pride on the part of the CAMU owner/operator and cultivates good neighbor relations with adjacent property owners. Housekeeping tasks include mowing grass on the CAMU cap and surrounding areas, controlling weeds, sweeping pavement surfaces, and collecting/disposing of litter or debris.

7.1.3 Maintenance Log

A maintenance log will be maintained by the owner/operator as part of the CAMU Operations Record.

7.2 CAMU PERMANENT CAP

On-site maintenance items are generally limited to grounds keeping tasks since no mechanical systems are provided. Drainage courses, structures, and cover liner integrity are the primary focus of scheduled inspection and preventative maintenance. Periodic inspection of other features, such as above-ground portions of monitoring wells and gas extraction vents is required as part of the informal monthly inspections.

7.2.1 Housekeeping

1. Grass cutting - Periodic cutting will help to establish and maintain a healthy, vigorous stand of grass. This will help control weeds and pests, reduce the potential for grass fires, and provide better erosion protection. In most settings, grass is cut to 4 to 6 inches in height and allowed to grow to a maximum height of 10 inches, at which time it will be cut by the owner/operator.

2. Spot Reseeding - It is important to keep a good stand of grasses on all areas of the cap to minimize erosion and to keep weeds and other undesirable plant species from becoming a problem. Spot reseeding should be done in late August and early September for best results, however, seeding in early spring may also be effective. Seeding in the dry summer months will most likely be unsuccessful without supplemental irrigation. Necessary seeding should be carried out at least once per year.

3. Nutrient Application - It may be necessary to periodically apply nutrients or adjust the acidity of the soil. If vegetative stress is evident, the topsoil may be analyzed to determine what nutrient deficiencies exist. This will prevent over-applying fertilizers. Generally, when required, a slow-release type of fertilizer can be applied in late summer to early fall. The local office of the Natural Resource and Conservation Service or Conservation District, or a local consultant may be contacted for additional information.

7.2.2 Preventive Maintenance

1. Weed and Pest Control - The key to minimizing necessary weed and pest control is to establish and maintain a good, healthy, dense grass cover. If weeds or pests become a problem, first identify the type of weed or pest and then develop a management strategy, chemical or manual, with the help of the local Natural Resource and Conservation Service or Conservation District or a local consultant. Make sure to choose a method that will not affect the integrity of the top liner system. Weed control using chemical herbicides may typically require 1 or 2 applications per year.

2. Rodent Control – Ground squirrels, field mice, and other burrowing animals may attempt to make their homes in the cover soils. Mounds of loose soil resulting from tunneling animals will encourage weed growth and promote erosion. The mounds should be raked and reseeded. Some burrowing animals could damage the CAMU Cell Cap liners. Appropriate pesticides may be used to control small rodents and burrowing animals. Make sure to choose a method that will not affect the integrity of the top liner system. A significant rodent population may require the advice of a local consultant.

7.2.3 Corrective Maintenance

The following section covers some problems that may be encountered during the post-closure care period. The solutions are by no means all inclusive, but should serve as general guidelines indicating the elements involved for fixing typical case conditions.

1. Subsidence - When an area experiences excessive localized settlement, the cover may no longer drain properly. Even so, there may not be a problem unless the area is large, there is continued ponding, or the flexible membrane liner is suspected to have been damaged. The problem may require an investigation to determine the extent of the damaged area and the potential for surface water leaking through the CAMU Cell Cap. If it is determined that a repair must be made, the necessary steps involved are:

    a. Determine limits of area to be repaired.
    b. Strip topsoil and stockpile.
    c. Remove gravel layer (drainage layer) and stockpile.
    d. Cut and remove geocomposite.
    e. Cut and remove flexible membrane liner.
    f. Cut and remove GCL.
    g. Fill depression and grade for proper drainage.
    h. Place low permeable soil layer, geosynthetic clay liner, or bentonite.
    i. Install new flexible membrane liner.
    j. Test seams to ensure integrity of repair.
    k. Install drainage net (if present).
    l. Replace gravel layer (drainage layer).
    m. Replace cover soil and topsoil and reseed area.

2. Erosion - Erosion problems should typically involve a relatively minor repair operation unless the condition is left to develop over time. Minor erosion rills in the topsoil may be filled and the area reseeded. An erosion mat of some type may prevent further erosion while the vegetation is being established. Deeper rills may require a more

extensive repair, possibly involving silt fencing. Persistent and reoccurring rills can be filled with gravel to allow for a controlled drainage path downslope.

7.3 CAMU TEMPORARY CAP

On-site maintenance items are to include repairs to the liner, seams, and sandbags. Cover liner integrity and anchorage are the primary focus of scheduled inspection and preventative maintenance. Periodic inspection of other features, such as above-ground portions of monitoring wells and storm water controls, will also be required.

7.3.1 Housekeeping

Liner Anchorage – Sandbags or tubes that are used to anchor the flexible membrane liner cap over the CAMU cell may need periodic adjustment to ensure they maintain proper spacing.

7.3.2 Corrective Maintenance

The following section covers some problems that may be encountered prior to permanent closure of the cell by construction of a permanent cap. The solutions are by no means all inclusive, but should serve as general guidelines indicating the elements involved for fixing typical case conditions.

1. Subsidence - When an area experiences excessive localized settlement, the cover may no longer drain properly. Even so, there may not be a problem unless the area is large, there is continued ponding, or the flexible membrane liner has been damaged. If it is determined that a repair must be made, the necessary steps involved are:

    a. Determine limits of area to be repaired.
    b. Remove sandbags or tubes from area.
    c. Cut and remove flexible membrane liner.
    d. Fill depression and grade for proper drainage.
    e. Install and seam new flexible membrane liner.
    f. Test seams to ensure integrity of repair.
    g. Replace sandbags or tubes to anchor flexible membrane liner.

2. Rips and tears - Repair of rips and tears in the liner cap is necessary not only to prevent water from leaking through to the underlying cell but also to prevent wind from getting under the liner. If allowed to get under the liner, high winds may inflate the surface of the flexible membrane cap to a point where sand bags will be dislodged.
3. Seam separation – Repair of separating or inadequately sealed seams is necessary for the same reasons as repair of rips and tears in the liner. Seams can be temporarily repaired using seaming tape, but should be permanently repaired by hot-air welding or sewing as soon as a liner installer can be called to the site.
4. Liner anchorage – High winds may cause liner edges to pull out or sandbags or tubes to displace. If this occurs, anchor trenches will be excavated, liner edges reinstalled, and the trench filled and compacted in accordance with the liner installation plans. Sandbags or tubes will be repositioned to provide evenly spaced anchorage on the cap liner.

8.0 POST-CLOSURE PLAN

This Post-Closure Plan identifies the activities that will be carried on after closure of the CAMU Phase 2 Cell and the frequency of these activities. Descriptions of planned monitoring and maintenance activities and frequencies for the post-closure period have already been addressed and comply with 40 CFR 264 – Subpart G regulations.

8.1 POST-CLOSURE CONTACT

Environmental Manager
ASARCO East Helena Plant
100 Smelter Road
P.O Box 1230
East Helena, Montana 59635
(406) 227- 4529

8.2 POST-CLOSURE NOTICES

No later than 60 days after certification of closure, the owner/operator will submit to the local zoning authority, or authority with jurisdiction over local land use, and to the EPA regional administrator a record of the type, location, and quantity of waste disposed within the CAMU cell. Within 60 day of certification of closure the owner/operator must:

1. Record, in accordance with State law, a notification on the deed to the facility property - or on some other instrument which is normally examined during a title search – that will in perpetuity notify any potential purchaser of the property that the land has been used to manage hazardous wastes, that its use is restricted under 40 CFR 264 – Subpart G regulations, and that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of within the cell have been filed with the local zoning authority, or authority with jurisdiction over local land use, and to the EPA regional administrator.
2. Submit a certification, signed by the owner/operator, that records the notation on the deed in accordance with State law, including a copy of the document in which the notation has been placed, to the EPA regional administrator.

8.3 POST-CLOSURE LAND USE

The site of the proposed CAMU Phase 2 Cell will be closed to public access after it is closed. The cell will be fenced to keep out unauthorized personnel and large animals. Limiting access to the site will ensure the integrity of the final cover is kept intact.

8.4 POST-CLOSURE COST ESTIMATE AND FINANCIAL ASSURANCE

The owner/operator has prepared a detailed cost estimate for the post-closure period that includes the annual cost of post-closure monitoring and maintenance of the facility in accordance with post-closure regulations 40 CFR 264.117-264.120. The cost estimate is included in Attachment D. The post-closure cost estimate is in accordance with 40 CFR 264.144. Costs for post-closure care activities are based on the owner/operator hiring a third party to conduct the work. The owner/operator will keep a copy of this post-closure cost estimate at the Asarco facility during the operating life of the facility. Financial assurance for the amount specified on the post-closure cost estimate will be established prior to the receipt of any waste.

ATTACHMENT A

ASBESTOS PROCEDURES

5.0 Asbestos and Lead Removal Techniques and Procedures

1) Asbestos-containing materials that will be removed from the site buildings and are judged by a competent person to be friable (i.e., those ACMs that, when dry, can be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

1) Lead Dust is present within the interiors of structures schedule to be demolished. These structure will be cleaned of the dust before demolition of the structure.

2) Lead Dust waste that is collected during cleaning of the structures will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

5.1 Notifications

1) IRSE will make required notifications to the Department of Environmental Quality and submit these notifications to CWC before beginning work.

5.2 Work Area Preparation

5.2.1 Warning Signs – Asbestos Abatement

2) Danger signs meeting the specifications of OSHA Construction Safety Order, Section 1529 and WAC 296-62-077 will be posted at any location and approach where regulated areas are present. Signs will be posted at a distance sufficiently far enough away from the work areas to permit any employee or visitor to read the sign and take the necessary protective measures to avoid exposure. Warning signs shall include the following wording:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2) These warning signs shall be printed in letters of sufficient size to be clearly legible.

5.2.2 Warning Signs- Lead Dust Abatement

3) Entrance by non- trained personnel into the lead paint removal area will be restricted using 3" barrier tape posted at the work area perimeter. Warning tape shall include the following wording:

Danger Lead Removal
Authorized Personnel Only

2) The warning tape shall be printed with letters of sufficient size to be clearly legible.

5.2.3 Electrical Power

1) The contractor will provide adequate power at each of the buildings. IRSE will provide temporary lighting sources and ensure safe installations (including ground faulting) of temporary power sources and equipment by complying with all applicable electrical code requirements and OSHA requirements for temporary electrical systems, within each building, as applies.

5.2.4 Establishing Asbestos Removal Work Areas

1) During indoor Class I removal of thermal system insulation, the wrap and cut method will be utilized. (HEPA) vacuums and wet methods will be utilized.

2) As applicable, IRSE will seal the exterior of the regulated areas. All windows, doors, and any other openings to the outside of the building from the regulated areas, will be sealed with a minimum of one layer of 6-mil poly sheeting with duct tape, until a negative exposure assessment is conducted.

3) During Class I removal of TSI using glovebag and wrap and cut methods with HEPA vacuum method procedures, the work area will be restricted using signs as described in 5.2.1. 6-mil poly will be installed on floors/ground in work area. Negative air machines may be installed in order to provide clean air from outside the work area at sufficient quantities and at strategic locations, so as to provide clean air in the workers' breathing zone, as described in Appendix D IRSE Hazardous Material Contractor Quality Control Plan.

4) During outdoor Class II removal of transite shingles and skirting, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

5) During outdoor Class II removal of metal siding, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

6) During Class II removal of floor covering, the work area will be restricted using signs as described in 5.2.1. 6-mil poly will be installed critical in the work area. Negative air machines will be installed in order to provide clean air from outside the work area at sufficient quantities and at strategic locations, so as to provide clean air in the workers' breathing zone, as described in Appendix D IRSE Hazardous Material Contractor Quality Control Plan.

7) During Class II removal of asbestos-containing roofing materials a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

8) During Class II removal of window caulking, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 5-10' out from the base of the building.

3) During removal of all Class II work, the area will be restricted using signs described in 5.2.1. Specific means and methods will be found in Appendix D.

6) 2" red "DANGER ASBESTOS - DO NOT ENTER" tape will be used to restrict access by untrained personnel.

5.2.5 Establishing Lead Dust Removal Work Areas

1) As applicable, IRSE will seal the exterior of the regulated areas. All windows, doors, and any other openings to the outside of the building from the regulated areas, will be sealed with a minimum of one layer of 6-mil poly sheeting with duct tape, until a negative exposure assessment is conducted.

2) 2" red "DANGER LEAD - DO NOT ENTER" tape will be used to restrict access by untrained personnel.

5.3 Workplace Entry and Exit Procedures – Asbestos and LEAD

1) IRSE will be using mobile trailer designed as a 3-stage worker decontamination unit, and a fixed worker decontamination unit (2- or 3-stage, depending on the scope of work at each individual work site) and locate it next to the entrance of the work area.

2) If the quantity of thermal system insulation exceeds 10 linear feet or 25 square feet, IRSE will construct a three-stage decontamination unit, including clean room, shower and dirty room, contiguous to the "regulated work area". If the quantity of ACM to be abated is less than 10 linear feet or 25 square feet, IRSE will construct a two-stage decontamination unit, including clean room and dirty room, contiguous to the "regulated work area". The procedures that will be used to enter decontamination units are described below.

3) Workers will enter the regulated work areas through the worker decontamination unit. The decontamination unit is a fully enclosed system.

4) These decontamination units will include an equipment or "dirty" room, a functional shower equipped with hot and cold running water (if necessary), and a changing or "clean" room in series. The decontamination units will also be constructed in such a manner as to provide a systematic reduction of contamination for the workers and equipment exiting the regulated work area. Personnel entry into and egress from the regulated work areas will be through the decontamination units. Equipment and material replenishment may also be conducted through the decontamination unit.

5) Wastewater resulting from the operation of the shower units shall be filtered with a 5-micron pore-size filtration system before reuse or discharge. To the extent feasible, filtered wastewater will be reclaimed and used on site for application in wet method work practices. Wastewater to be discharged shall be sufficiently filtered to meet state and local water quality objectives before discharge. Filters shall be changed as necessary to achieve this objective.

6) Before exiting the work area, personnel shall remove outer protective clothing and use a HEPA vacuum to remove ACM debris from protective clothing. Workers shall then proceed to move disposable clothing and dispose of it as hazardous waste. Non-disposable clothing (such as work boots) shall be decontaminated before being removed from the work area.

**Removing asbestos dust from protective clothing or equipment by blowing, shaking, or any other means that disperses asbestos fibers into the air shall likewise be prohibited.

6) If applicable, workers exiting the regulated work areas will wash (shower) all areas of the body that were potentially exposed to asbestos contamination. *Respirators shall continue to be worn by workers until the worker has entered the shower and begun to wash.* Once the head has been deluged with water, the respirator may be removed. IRSE will supply workers with soap and shampoo to use in the showers.

7) A secure change room shall be provided outside the decontamination units and shall be equipped with storage for workers' street clothes and personal belongings. Workers are to change from street clothes each day before entering the regulated work area. Workers are to change back into street clothes each day before leaving the work site. Personnel are prohibited from wearing potentially contaminated clothing off the site. Housekeeping within the change room will be maintained by IRSE. Periodic area air monitoring will be conducted to evaluate housekeeping efforts.

8) Waste containers shall also be decontaminated using HEPA vacuums and by wet wiping before being removed from the work areas.

9) In the event an emergency egress from within the regulated work is required, the above-described personnel decontamination procedures will not be required. IRSE will exercise judgment to ensure that worker health and safety is placed above environmental contamination concerns.

10) In those instances when it is not feasible to provide shower facilities contiguous with the work area or where the work is performed outdoors, the Contractor shall ensure that employees remove (1) asbestos contamination from their worksuits in the equipment room utilizing a HEPA vacuum before proceeding to a shower that is not adjacent to the work area, or (2) their contaminated worksuits in the equipment room, don a clean worksuit, and proceed to a shower that is not adjacent to the work area. A second inner disposable/breathable Tyvek whole-body coverall may be utilized by workers for modesty's sake under the primary outer worksuit. The outer suit will be cleaned using a HEPA vacuum and removed within the isolated work area.

11) The containment design and decontamination unit that will be utilized for each work area will be dependent on the DEQ asbestos work classification.

5.4 Personal Protective Equipment

1) Except when more stringent requirements are set forth, the personal protective equipment (PPE) utilized during the conduct of this work must meet or exceed the requirements contained in Title 29 CFR 1926.1101.

5.4.1 Respiratory Protection

1) Half-face negative pressure respirators (equipped with HEPA filters) will be utilized for Class I and II materials being removed on this project. Protective glasses or goggles worn by workers will conform to the specifications of the ANSI Z87.1 standard of Title 29 CFR §1910.133.

2) Half-face negative pressure respirators (equipped with HEPA filters) will be worn by all personnel working within Lead Dust Removal Work Areas.

3) Once a negative pressure enclosure (if applies) has been visually inspected and placed under a negative air pressure differential, full-faced supplied air respirators operated in constant flow or pressure demand mode and equipped with HEPA escape filters, will be worn by workers, supervisors, work monitors, industrial hygienists, and other entering the regulated work area.

3) During outdoor Class II removal of materials, half-face negative pressure respirators equipped with HEPA filters will be used.

4) During indoor Class II removal of all materials identified, half-face negative pressure respirators equipped with HEPA filters will be used.

5) All respirators shall be used in a manner consistent with state-of-the-industry practices. The respirators shall be worn with head straps in direct contact with the head and shall not be worn on the outside of the hoods of disposable whole-body coveralls. An exception to this is allowable in those instances when a remote decontamination unit is being utilized and the worker is double suited. Respirators shall be worn until proper personal decontamination methods, as described herein, are completed.

6) The Contractor will provide respirators in accordance OSHA 1019.133 Respirator Protection

5.4.2 Whole Body Protection

1) Work boots with nonskid soles or impermeable work-boot covers shall be worn by workers. Protective footwear worn by workers shall conform to the specifications of the ASNI Z41.1 standard. Work boots that have come into contact with contaminated material shall be cleaned, decontaminated, and bagged before removal from the work area.

2) Protective head gear (hard hats) shall be worn at all times that work is in progress. Protective head gear worn by workers shall conform to the specifications of the ANSI Z89.1 (Class A) standard. Hard hats shall be thoroughly decontaminated before removing from the work area.

3) In work areas where excessive noise is prevalent, worker shall wear hearing protection sufficient to ensure that the worker's 8-hour time-weighted average (TWA) exposure does not exceed 85 Dba.

4) IRSE will make available extra sets of PPE to be used by the owners authorized representative for use to enter the regulated work areas.

5.5 Asbestos Removal Techniques and Procedures

1) For the purposes of this work plan, the removal of ACM thermal system insulation (TSI) or ACM surfacing materials will be considered "Class I Asbestos Work," as defined by OSHA 1915.1001 and Title 29 CFR 1926.1101 and shall be conducted in accordance with work practices and requirements set forth for Class I work.

2) IRSE will conduct the construction activities described herein in accordance with all currently applicable federal, state, and local laws and regulations including, but not limited to, Title 29 CFR 1926.1101.

3) All asbestos-containing material thermal system insulation will be removed via the glovebag method or glovebag and wrap and cut method, with negative air ventilation procedures.

5.5.1 Removal of ACM Thermal System Insulation from Buildings

5) IRSE will then pre-clean the work area. This will entail cleaning of any visible asbestos debris and dirt which may affect area and clearance air monitoring. Following pre-cleaning, IRSE will begin installing glovebags on the pipes which have been determined to contain asbestos-containing thermal system insulation.

6) The IRSE Competent Person will then conduct visual inspections and smoke testing on the glovebags and ensure that all necessary tools are present, including Hudson sprayers, waste bags, and a HEPA vacuum.

7) Only after satisfactory visual inspections from the IRSE Competent Person will the go ahead to begin asbestos removal be given.

8) All glovebagging will be conducted in two-man crews. One worker will remove the asbestos-containing pipe insulation inside the glovebag while the other worker constantly mists the insulation with amended water.

9) Once the ACM insulation has been removed from the pipe and is on the bottom of the glovebag, the pipe and top inside portion of the glovebag will be wet wiped clean. IRSE will twist the bag several times and tape it to keep the ACM in the bottom during removal of the glovebag from the pipe. A HEPA vacuum should be used to evacuate air out of the glovebag.

10) A 6-mil disposal bag will be slipped over the glovebag (while still attached to the pipe). The tape holding glovebag to pipe will then be removed and the top of glovebag opened then folded down into waste bag.

11) Following an acceptable visual inspection from the CWC Site Safety Officer, IRSE will apply an encapsulant to all surfaces in the work area and clearance sampling can be collected for analysis.

5.5.2 Outdoor Removal of Transite Shingles and Metal Siding

1) The workers will don appropriate PPE as described in Section 5.4.

2) IRSE will perform setup of the work area as described in Section 5.2.3(3).

3) IRSE will notify the on-site Safety Officer prior to beginning removal so that visual inspections can be conducted to insure that all necessary tools are available, including water, HEPA vacuum, lined dumpster.

4) After satisfactory visual inspection by the Safety Officer, IRSE will begin transite removal.

5) Transite removal will be conducted using methods described in the IRSE Hazardous Material Contractor Quality Control Plan.

5.5.3 Removal of all other Class II Materials

1) The workers will don appropriate PPE as described in Section 5.4.

2) IRSE will perform setup of the work area as described in Section 5.2.3(7).

3) IRSE will notify the on-site Safety Officer prior to beginning removal so that visual inspections can be conducted to insure that all necessary tools are available, including water, HEPA vacuum, lined dumpster.

4) After satisfactory visual inspection by the Safety Officer, IRSE will begin removal of specific materials, as identified in Appendix D.

5) Class II removal will be conducted using methods described in the IRSE Hazardous Material Contractor Quality Control Plan.

5.5.4 Final Visual Inspection of Work Area

1) Following an acceptable visual inspection by the CWC Site Safety Officer after asbestos removal from each asbestos removal work area, IRSE will apply an encapsulant to all surfaces in the work area and clearance sampling can be collected for analysis.

2) All abated areas will be inspected by the Contractor, CWC Onsite Supervisor and IRSE supervisor. Upon successful inspection, each will sign the completed form *"Final Inspection Report"* Form. The Form can be found at the end of Attachment C: Forms.

5.6 Removal of Lead Dust from Buildings

1) IRSE will conduct the construction activities described herein in accordance with all currently applicable federal, state, and local laws and regulations including, but not limited to, Title 29 CFR 1019.10025.

5.6.1 Vacuuming Lead dust in Building

1) The workers will don appropriate PPE a stated in Section 5:4 and IRSE Hazardous Material Quality Control Plan.

2) IRSE will then perform setup of the "Lead Removal Work Area" as stated in Section 5.2.4. (1), including installing critical barriers.

3) IRSE will also install a two stage decontamination unit as stated in Section 5.3. The decontamination unit will be placed at the doorway leading into the building or at a central area on site.

4) Once the decontamination unit and all critical seals have been installed, the IRSE Competent Person will perform a visual inspection of the work area to ensure that all critical seals are in place and that adequate negative pressure has been established, if applies.

4) All abated areas will be inspected by the Contractor, CWC Onsite Supervisor and IRSE supervisor. Upon successful inspection, each will sign the completed form *"Final Inspection Report"* Form. The Form can be found at the end of Attachment C: Forms.

6.0 Waste Handling and Disposal

6.1 Packaging and Storage of Waste and Removal from the Work Area

1) The friable ACMs that will be removed from the project site and are judged by a competent person to be friable (i.e., those ACMs that, when dry, can be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

2) Friable asbestos waste shall be placed in two layers of 6-mil polyethylene disposal bags.

3) All friable asbestos waste (bagged) will exit the work area through the equipment room of the decontamination unit or from a separate waste load out decontamination unit. These waste loads out units will be contiguous to the work area containment.

4) The personnel loading the asbestos-containing waste will be protected by disposable clothing and, at a minimum, half-facepiece air-purifying dual-cartridge respirators equipped with high efficiency filters.

5) The bagged or wrapped asbestos waste shall be properly labeled and placed in locked storage containers. At a minimum, the outside of each waste bag or package containing asbestos hazardous waste will be labeled as described in 6.2(5).

6.2 Packaging and Storage of Nonfriable Waste and Removal from the Work Area

1) The nonfriable ACMs that will be removed from the project site and are judged by a competent person to be nonfriable (i.e., those ACMs that, when dry, cannot be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

2) Nonfriable asbestos waste will be loaded directly into a mega boxes, (Gaylord boxes) place in disposal bags and doubled bagged or double wrapped with 6 mil poly.

3) The personnel loading the asbestos-containing waste will be protected by disposable clothing and, at a minimum, half-facepiece air-purifying dual-cartridge respirators equipped with high efficiency filters.

5) The wrapped asbestos waste shall be properly labeled and placed in locked storage containers. At a minimum, the outside of each package containing asbestos hazardous waste will be labeled as follows:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
HAZARDOUS WASTE
STATE AND FEDERAL LAW
PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY OF THE WASHINGTON DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Generator's Name_____
Address _____
Manifest _____
RQ, Asbestos, 9, NA2212, III

6) The asbestos disposal containers (e.g., bags, wraps and boxes) and storage areas shall be secured and placarded with appropriate warning signage

6.3 Transportation and Disposal

1) The disposal of waste that contains asbestos waste and lead waste will stay onsite and be placed in a storage area designated by the General Contractor.

ATTACHMENT B

INSPECTION FORM AND SITE MAP

UPDATE TIME: 8:30AM
MWR \HEL\02\0107\I:\Land Projects\604301\dwg\604301H029.dwg

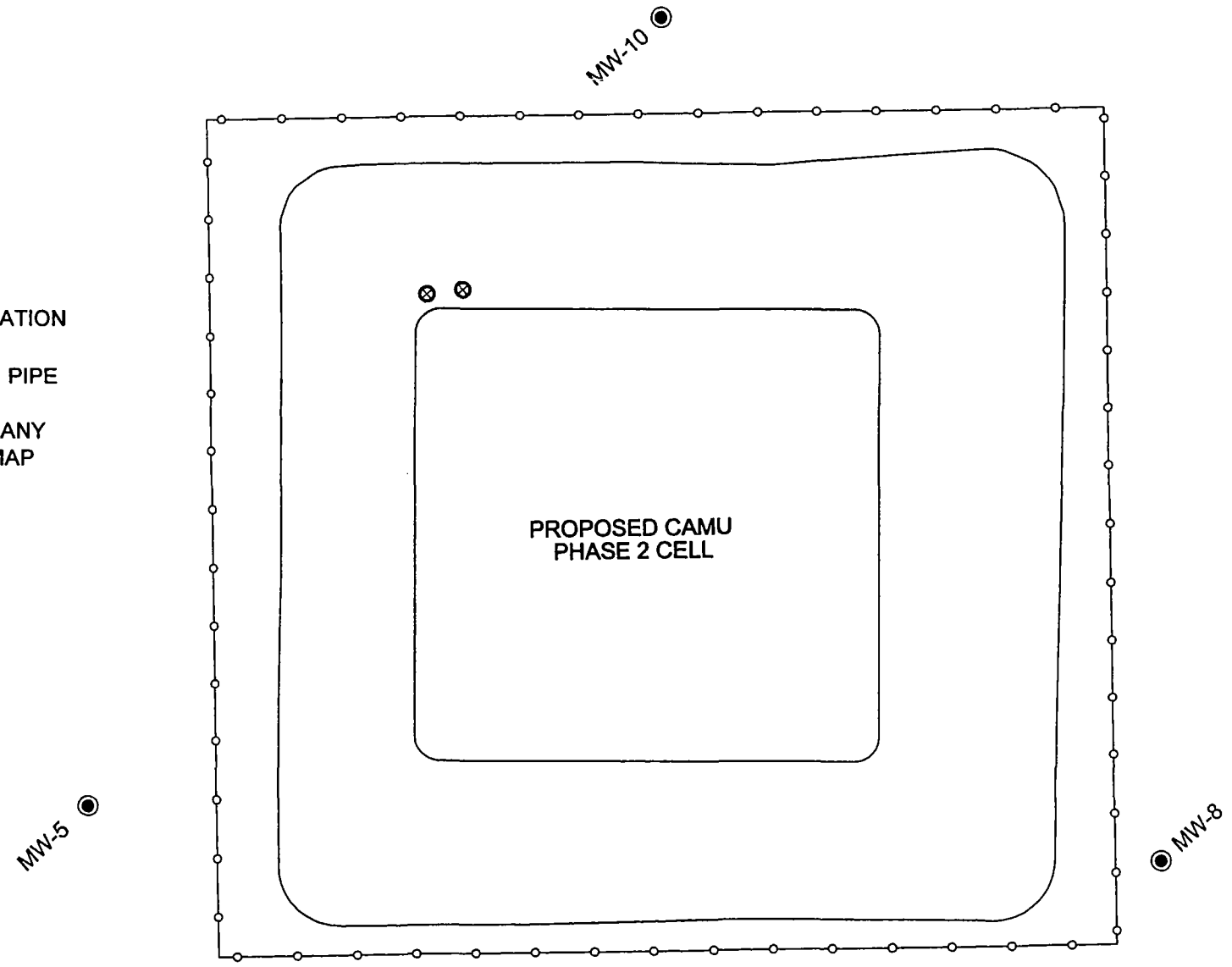
SCALE
0 IN FEET 100

LEGEND

◉ MONITORING WELL LOCATION

⊕ LEACHATE COLLECTION PIPE

MARK LOCATION OF ANY
DEFICIENCIES ON MAP



ASARCO EAST HELENA CAMU PHASE 2 CELL OPERATION AND MAINTENANCE PLAN	**CAMU PHASE 2 CELL INSPECTION MAP**	**FIGURE** **A-2**

Hydrometrics, Inc.
Consulting Scientists and Engineers

DAILY INSPECTION FORM

AREA INSPECTED	Cell No. PHASE 2 CELL	DAILY INSPECTION	Inspected by: _____	Date:		
	ITEM NO.	CONDITION	OBSERVATION	ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
SURROUNDING GROUNDS	Visible Dust					
	Potential for Windblown Dispersion					
HAUL ROADS	Visible Dust					
	Visible Debris					
	Run-on					
	Run-off					
	Other:					
Additional Comments:						

WEEKLY INSPECTION FORM

AREA INSPECTED	Cell No. PHASE 2 CELL	WEEKLY INSPECTION	Inspected by: _____	Date:		
	ITEM NO.	CONDITION	OBSERVATION	ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
SURROUNDING GROUNDS	Visible Dust					
	Potential for Windblown Dispersion					
HAUL ROADS	Visible Dust					
	Visible Debris					
	Run-on					
	Run-off					
	Condition					
CONDITION OF:	Fences					
	Gates					
	Storm Water Pond					
	Presence of Precipitation run-off or Ponded Liquids					

Additional Comments:

Annual Operational and Maintenance Costs for East Helena CAMU Cell

Activity			Hrs	People	Rate *	Times/Year	Total
Mowing of Grass/Weed Abatement				1	$300 /yr	1	$300
Monthly Inspections			1	1	$68 /hr	12	$816
Semi - Annual Inspection		Inspection and Report			$3,500 each	2	$7,000
		Respond to Comments			$3,500 each	2	$7,000
Pump Leachate Collection/Leak Detection			4	2	$68 /hr	12	$6,528
Well Sampling/Monitoring	Labor						
		Prep	4	1	$68 /hr	4	$1,088
		Sampling	16	2	$68 /hr	4	$8,704
		Sample handling/Unload	4	1	$68 /hr	4	$1,088
	Equipment	Grundfos pump & controller		2	$175 /day	4	$1,400
		Generator		2	$55 /day	4	$440
		YSI multimeter		2	$70 /day	4	$560
		Water Tank		2	$48 /day	4	$384
		Truck		2	$35 /day	4	$280
				Wells			
	Analytical			11	$350 each	4	$15,400
						Grand Total	$50,988

* Outside contractor rates were used to calculate cost figures.

Financial Assurance	
Applying a 30 Year Good Accounting Practices for Financial Assurance	$101,975

ATTACHMENT C

SAMPLING AND ANALYSIS PLAN

ATTACHMENT C

SAMPLING AND ANALYSIS PLAN

Prepared for:

ASARCO LLC
P.O. Box 1230
East Helena, MT 59635

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

June 2007

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ATTACHMENT C

SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This Sampling and Analysis Plan is designed in order to collect representative samples of waste being hauled and placed in the CAMU Phase 2 Cell. This Plan provides the methodology and procedures for each task presented in the plan. The follow tasks will be conducted to obtain representative samples of waste and to characterize the waste being hauled to the CAMU Phase 2 cell:

- Description of payload inside sampled trucks;
- Grab sampling of wood, dirt, dust, brick, and concrete materials; and
- Laboratory analyses of collected grab samples.

2.0 SAMPLING METHODOLOGY

2.1 SAMPLING FREQUENCY AND PROCEDURES

Demolition waste being hauled to the CAMU Phase 2 Cell from disposal will be sampled from the payload of the haul truck, after the haul truck has been weighed but prior to the haul truck leaving the Smelter facility.

During cleaning and demolition work at the Smelter facility, 11 work areas and three areas where waste is currently being stored will have waste removed and transported to the CAMU Phase 2 Cell. These work areas are presented in Table 1. Work area designations are based on the contractors schedule for demolition, processes that occurred

TABLE 1. WORK AREAS

Work Area	Buildings Included	Stage of Demolition
1	Contractor's Lunchroom, Highline Railroad, Garage, Contractor's Change House, Main Office, Main Natural Gas Valve House	Stage 1
2	Dross Plant Baghouse and 200' Stack, Blast Furnace Building, Charge Building	Stage 1
3	Thawhouse	Stage 1
4	Blast Furnace Flue, Monier Flue	Stage 2
5	Acid Plant Cooing Tower, Truck Loading and Spray Dryer Building, Sand Filters, Auto Shop, Acid Plant Shop, Ringling Dust Building	Stage 2
6	400' D&L Stack, 200' Acid Stack, 425' Blast Furnace Stack	Stage 2
7	Acid Plant, Pump Tank Building, Main Blower Building	Stage 2
8	Blast Furnace Baghouse	Stage 2
9	Ore Unloading Building, Crushing Mill, Sample Mill	Stage 2
10	Materials Stored in Concentrate Storage and Handling Building, Coverall Building, and Direct Smelt Building	Throughout
11	Highline Railroad Remainder, Blast Furnace Office, Power House, Blast Furnace Heat Exchanger, Machine Shop, Direct Smelt Building, Breaking Floor, Locomotive Crane Shed, Blast Furnace Lunchroom, Pump House, Blacksmith Shop, Carpenter Shop, Abandoned Breaking Floor, Sinter Stockpile Building	Alternate A
12	Masons Shop, Motor and Paint Shop, Paint Storage Building, Meeting Room, High Lead Welding Shop, Oil HS, Refractory Storage, Zinc Plant O_2 Building	Alternate B

in these areas, and the materials used to construct the buildings. A sample will be collected from one out of every 20 trucks hauling waste from each of the eleven work areas and the three waste storage areas. Therefore, at least one sample will be obtained from each of the 12 areas for every 20 haul trucks that transport waste from that area to the CAMU Phase 2 Cell.

Each haul truck payload to be sampled will be visually divided up into five areas. A grab sample will be collected in accordance with Standard Operating Procedures outlined in Attachment 1 at a random location within each of the five areas. All five samples will be combined to form a representative composite sample of the waste material being hauled. Large pieces of brick and concrete will be sampled by collecting chip samples according to HM-SOP-37. Large pieces of wood and timber will be sampled according to HM-SOP-47. Broken debris, dirt, and dust will be sampled according to HM-SOP-6. All five samples will be combined into one composite sample, mixed thoroughly, and that one composite sample will be sent to the lab and analyzed.

A sampling notebook will be maintained, and will include the location and work area where waste is being hauled from, a description of the materials in the haul truck payload, the sample identification number, and the date and time the sample is taken.

3.0 LABORATORY PROCEDURES

Laboratory analysis will be performed for the eight RCRA metals (Lead, Arsenic, Silver, Selenium, Barium, Chromium, Cadmium, and Mercury) using Toxic Characteristic Leaching Procedure (TCLP) EPA Method 1311.

ATTACHMENT 1

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURES

PACKING AND SHIPPING SAMPLES
HF-SOP-4

1.0 PURPOSE

This procedure is to be followed when packing and shipping water or soil samples to the laboratory by commercial carrier. The Chain-of-Custody standard operating procedure (**HF-SOP-5**) also must be followed if required in the project plan.

2.0 PROCEDURE

2.1 All samples must be labeled and labels filled out in waterproof ink. The label can be Hydrometrics' standard shipping label or may be a project-specific label. Sample labeling procedures are detailed in **HF-SOP-29** (Labeling and Documentation of Samples).

2.2 All samples are placed in the shipping container - normally a metal or plastic cooler.

2.3 Packing:

2.3.1 Sample containers are typically placed in a cooler. Other commercially available insulated containers may be used. The project manager should determine that the containers are appropriate to the type of sample being shipped.

2.3.2 If trip blanks are required, typical for organics sampling, be sure one is present for each and every shipping container.

2.3.3 If an ice pack is used, place the ice pack in the cooler or cooler lid as needed. Fill space with bubble mat wrap or packing material. If necessary, place bubble wrap on top of samples. Sufficient packing material should be used to prevent sample containers from contacting each other during transport.

2.3.4 If custody seals are required, they will be placed on at least two places connecting the cooler container lid to the cooler.

2.3.5 Coolers are then wrapped with nylon strapping tape. Two full rotations of tape will be placed at least two places on the cooler.

2.4 Packing and shipping procedures for Superfund facilities should follow guidelines outlined in the EPA document "A Compendium of Superfund Field Operating Methods."

3.0 SHIPPING

Samples can be sent by commercial air carrier, overnight express, Federal Express or other means. The allowable holding time and often the ability to keep samples cold are important considerations. Copies of all shipment records must be kept in the project files.

Each sample container will be marked with:

- Sampling organization name, address and telephone number;
- Laboratory name, address and telephone number; and
- Ship samples via courier following any applicable DOT requirements. The project manager should determine if there are any special shipping considerations.

3.1 Documents

Each shipping container will contain a description of samples enclosed, date of collection and date of shipment, either a cover letter or a Request for Analytical Services, and/or a Chain-of-Custody form. See Labeling and Documentation of Samples **(HF-SOP-29)**.

For Chain-of-Custody shipments complete a Chain-of-Custody form (see Chain-of-Custody Standard Operating Procedure **HF-SOP-5**).

- Sign the form.
- Place two copies in zip-lock bag in sample container.
- Keep one signed copy in project file.

Signing of the Chain-of-Custody form (record) relinquishes custody of the samples. Relinquishing custody should only occur when directly shipping to the analytical laboratory.

4.0 RELATED REFERENCES

U.S. EPA, 1982. Handbook for Sampling and Sample Preservation of Water and Wastewater. EPA-600/4-82-029.

U.S. EPA, 1987. A Compendium of Superfund Field Operations Methods PB88-181557.

STANDARD OPERATING PROCEDURE

CHAIN-OF CUSTODY
HF-SOP-5

1.0 PURPOSE

The purpose of this procedure is to maintain a chain-of-custody for samples. All soil and water samples collected and sent to the laboratory for analysis will be documented using standard chain-of-custody procedures.

2.0 CUSTODY PROCEDURE

Samples will be collected at established project sampling sites using Standard Operating Procedures (SOP). Sampling activities will be recorded in the samplers daily log book and the appropriate collection form(s) completed (see appropriate sampling SOP). Each sample container will be identified by labeling. Labels are attached to sample bottles and are protected with clear label tape to prevent abrasion of labeling information and to guard against failure of label adhesive.

2.1 Sample Identification

Each sample bottle should be labeled with the following information:

- Site;
- Sample Number;
- Person taking the sample;
- Date and time of collection;
- Sample matrix (water, soil, oil, etc.);
- Basis (total or dissolved);
- Preservation; and
- Analyses to be performed.

Labels will be written in waterproof ink.

Use of pre-printed, self-adhesive labels, if available, is preferred.

All samples must be traceable from the time the samples are collected until they are received by the analytical laboratory. The laboratory is then responsible for custody during processing and analysis.

A sample is under custody if:

- It is in your possession;
- It is in your view, after being in your possession;
- It was in your possession and then you locked it up to prevent tampering; or
- It was in your possession and then you placed it in a designated secure area.

2.2 Custody Records

Each sample is identified on a Chain-of-Custody Form(s) by its sample number, date and time of collection, and analysis requested.

Documents will consist of:

- Sample collection records;
- Chain-of-Custody form(s);
- Analytical Parameter List(s) **including analytical methods and detection limits** if not on the Chain-of-Custody form;
- Shipping receipt(s); and
- Purchase Order(s).

3.0 CUSTODY TRANSFER AND SHIPMENT

All samples will be accompanied by **Chain-of-Custody** record. The following procedures will be followed:

- When transferring the possession of samples, the individual(s) relinquishing and receiving will sign, date and note the time on the record. This record documents sample custody transfer from the sampler to the laboratory.

- Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier name(s) and other pertinent information are entered in the "Remarks" box.

- All shipments will be accompanied by the **Chain - of - Custody Record** identifying its contents. The original record will accompany the shipment and a copy will be retained in the project file.

- Analytical parameters requested must be noted on the Chain-of-Custody Record, or an attached analytical parameters list accompanying the Chain-of-Custody Record. If not attached to the Chain-of-Custody, an Analytical Parameter List **including analytical**

methods and detection limits must be included with each shipment and should specify methods of analysis required for each parameter.

- All shipping receipts (next day air waybills, freight bills, post office receipts, bills of lading, etc.) purchase orders, and sample collection records will be retained in the project file.

4.0 CUSTODY SEALS

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals. Some custody seals are serially numbered. Other custody seals are unnumbered seals or evidence tape.

Two seals must be placed on each shipping container (cooler), one at the front and one at the back. Clear tape should be placed over seals to ensure that seals are not accidentally broken during shipment.

STANDARD OPERATING PROCEDURE

DECONTAMINATION OF SAMPLING EQUIPMENT
HF-SOP-7

1.0 PURPOSE

1. Unless entirely disposable sampling equipment is used, cross-contamination can occur and sampling equipment must be decontaminated between sampling locations.

2.0 EQUIPMENT

One or more of the items below is required. Check procedures that follow.

Tap water	Gloves (latex or nitrile)	
Non-phosphate detergent	Distilled or Deionized (DI) Water	Buckets
High Pressure Washer	Organic solvent (preferably hexane or methanol), certified ACS Grade or better	Brushes

3.0 PROCEDURES

Effective decontamination of sampling equipment for sampling inorganics can be achieved by using the following three step process:

1. Wash equipment in warm water and detergent, scrubbing with brushes as necessary to remove visible contaminants;

2. Rinse equipment thoroughly with clean tap water; and

3. Rinse equipment thoroughly with DI (deionized) water.

Deionized or distilled water used during sampling equipment decontamination should be obtained from a source with documented capability to produce contaminant-free water. The source of DI water used (both production source and individual carboy) and any available measurements such as specific conductivity should be recorded in the field notebook. At least 50 mL of DI water should be run through the DI carboy spout prior to using DI water for decontamination or blank sample purposes.

Specific decontamination procedures used should be recorded in field notebooks. Special procedures (i.e., dilute acid rinses, alternate solvent rinses) may be required for some projects.

Any departures from the basic protocol given above for inorganics or organics should also be noted.

The subsections below suggest specific procedures relevant to equipment which may require frequent decontamination.

3.1 Containers

Containers may be used to composite or hold water or soil samples. Between samples, these containers must be decontaminated. Water sample containers also should be rinsed a minimum of three times with water to be sampled.

3.2 Soil Piston Sampler

The soil piston sampler will be decontaminated between sample sites by washing in warm water and detergent followed by rinses in tap water and DI water.

3.3 Soil Coring Devices

Soil samples may be obtained from drill holes by use of coring devices. Split spoons or Shelby tubes can be used. These devices will be decontaminated by thoroughly washing between each sampling depth and sampling sites. Washing will include warm water and detergent followed by a rinse with tap water and DI water.

STANDARD OPERATING PROCEDURE

PROCEDURE FOR COLLECTING SOIL, DUST, AND SMALL DEBRIS SAMPLES©
HS-SOP-6

1.0 PURPOSE

This SOP describes the procedure for collecting a soil, dust, and/or small debris samples for subsequent chemical analysis.

Sample types and sample characteristics can vary considerably within and between sampling sites. It is important, therefore, that detailed records be taken; particularly of the sampling location, depth, and characteristics such as material and color.

2.0 EQUIPMENT

- Stainless steel spoon or plastic spoon;
- 1 gallon size Zip-lock plastic bags (metals);
- Surgical gloves; and
- Field notebook.

When sampling for metals, a stainless steel or plastic spoon should be used for collecting the sample. Sampling tools which are plated with chrome or other materials are to be avoided.

3.0 PROCEDURE

1. Determine the truck/load number to be sampled and record it in the field notebook. The notes and drawings should outline the location of sample units and sample sites, sample site names, sample depths and sample numbers, as appropriate.

2. The truck payload should be divided up into five equal areas and a sample should be collected from each area where soil, dust, or small debris is present. A stainless steel or plastic spoon should be used to collect the sample. Generally, between 100 and 500 grams of soil is required. If more sample is required the sampling area should be expanded.

3. For grab samples, soil collected using a stainless steel or plastic spoon (at the surface or at depth) should be placed directly into the sample container. For metals samples a plastic zip-lock bag is an appropriate container. Generally, coarse material should be excluded from the sample (greater than approximately 1/4 inch where feasible).

4. For composite samples or field split samples, the soil grab sample should be transferred from the stainless steel or plastic spoon to a stainless steel mixing bowl, Teflon tray, or similar device free of potential sample contaminants. Once all grab samples are collected, the sample should be thoroughly mixed prior to transferring the sample to the sample container. Alternately, composite samples may be obtained by transferring each grab sample directly to the plastic sample bag, provided there is sufficient room in the sample to ensure thorough mixing of the sample within the bag. (Since the laboratory may only use a small portion of the total sample, it is important that the sample be thoroughly mixed so that the analysis is representative of all sample grab locations.)

5. Sample containers should be labeled, at a minimum, with sample date and sample number to permit cross referencing with the field notebook. If the sample is not to be submitted as a completely blind sample, other information may also be appropriate including sample depth, station identification, soil type. Refer to **HF-SOP-29**, Labeling and Documentation of Samples.

6. Refer to **HF-SOP-5**, Chain-of-Custody, and **HF-SOP-4**, Packing and Shipping Samples for sample handling procedures.

7. All equipment which contact the soil should be decontaminated after collecting the sample. Refer to **HF-SOP-7**, Decontamination of Sampling Equipment.

STANDARD OPERATING PROCEDURE

LABELING AND DOCUMENTATION OF SAMPLES
HF-SOP-29

1.0 PURPOSE

Documentation of all samples is an important aspect of the project quality assurance program. This SOP specifically describes sample labeling procedure, but also addresses related aspects of sample documentation, all or some of which may be required by the project Quality Assurance Project Plan (QAPP).

2.0 EQUIPMENT

Sample documentation will involve use of some or all of the following:

1. Sample Identification Tag or Labels;
2. Chain-of-Custody Records;
3. Custody Seals;
4. Sample Analysis Form, or cover letter and parameter list; and
5. Field Notebooks.

These documents are sequentially numbered or sequentially paged.

All forms are completed using waterproof ink. Where necessary, the sample labels are protected with label protection tape.

3.0 SAMPLE IDENTIFICATION TAGS OR LABELS

Projects which may be the subject of litigation or are mandated by the EPA typically require serially numbered Sample Identification Tags. Sample labels (generally self-adhesive) are used in lieu of Sample Identification Tags for many projects and provide the same information, but are not serially numbered. The following discussion pertains specifically to use of Sample Identification Tags but, except for the next two paragraphs, is applicable to sample labeling in general.

Sample Identification Tags are distributed to field investigators and the serial numbers are recorded in project files and the field notebook. Individuals are accountable for each tag assigned to them. A tag is considered in their possession until it has been filled out, attached to a sample and transferred to another individual with the corresponding Chain-of-Custody Record.

At no time are any Sample Identification Tags to be discarded. If any tags are lost, voided or damaged, the circumstances are noted in the appropriate field notebook immediately upon discovery and the Quality Assurance officer notified. At the completion of the field investigation activities, all unused Sample Identification Tags are returned and are checked against the list of assigned serial numbers.

Samples are removed from the sample location and transferred to a laboratory or other location for analysis. Before removal, however, a sample is often separated into fractions depending on the analysis to be performed. Each portion is preserved in accordance with prescribed procedures and each is identified with a separate Sample Identification Tag. In this case, each tag should indicate in the "Remarks" section that it is a split sample.

The information recorded on the tag or label includes:

- **Project Code**. An assigned Hydrometrics number (optional);
- **Station Number**. A code assigned by the Field Team Leader (optional), which identifies the station location;
- **Date**. A six-digit number indicating the year, month and day of collection;
- **Time**. A four-digit number indicating the 24-hour clock time of collection (for example, 1345 for 1:45 p.m.);
- **Sample Number**. The sample code number assigned to that sample and recorded in the field notebook;
- **Samplers**. Each sampler's name;
- **Preservative**. The tag should indicate whether a preservative is used, the type of preservative, and whether the sample has been field filtered;
- **Analysis**. The general type of analysis requested;
- **Tag Number**. A unique serial number, stamped on each tag (optional); and
- **Remarks**. The sampler's record of pertinent information (sample matrix, dissolved vs. total, highly contaminated, etc.).

The tag used for water, soil, and sediment samples contain an appropriate place for designating the sample as a grab or a composite, identifying the type of sample collected for analysis, and indicating preservation, if any. The Sample Identification Tags are attached to or folded around each sample and are taped in place.

After collection, separation, identification and preservation, the sample is handled using chain-of-custody procedures as discussed in the **Chain-of-Custody Standard Operating Procedure (HF-SOP-5)**.

If the composite or grab sample is to be split, aliquoted portions are placed into similar sample containers. Sample Identification Tags are completed and attached to each container. Tags on quality control samples (e.g. blank, duplicate, blind field standards) are NOT marked to identify samples as such.

3.1 Sample Code Numbering of Duplicate Samples for XRF Analyses

When collecting duplicate soil samples to be analyzed by XRF techniques, the duplicate sample number is the same as the original sample number with the exception of a suffix "D" designation.

For example:	XYZ-9710-100	Original Sample Number
	XYZ-9710-100D	Duplicate Sample Number

4.0 CHAIN-OF-CUSTODY

Samples collected during any investigation may be used as evidence and their possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To document sample possession, Chain-of-Custody procedures are followed. These procedures are described in the **Chain-of-Custody Standard Operating Procedure (HF-SOP-5)**.

5.0 SAMPLE SHIPMENT

Samples are packaged properly for shipment as described in the **Packing and Shipping Samples Standard Operating Procedure (HF-SOP-4)** and dispatched to the appropriate laboratory for analysis.

If sent by mail, the package is registered with return receipt requested. If sent by overnight express courier or common carrier, a Bill of Lading is used. Air freight shipments are sent collect. Freight bills, Postal Service receipts and Bills of Lading are retained as part of the permanent documentation.

When Chain-of-Custody is required, a separate custody record must accompany each shipment. When transferring samples, the individuals relinquishing and receiving samples will sign, date and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst at the laboratory.

6.0 SAMPLE ANALYSIS REQUEST

Samples sent to a laboratory for testing will be accompanied by a Request for Analytical Services or cover letter that describe the samples, specifies the testing required, and who is to receive the analytical report. Commonly, a standard analytical schedule is used for a project and this schedule should be attached to the Request for Analytical Services or cover letter.

7.0 FIELD NOTEBOOKS

A bound field notebook must be maintained by the Field Team Leader to provide a daily record of significant events, observations and measurements during field investigations. All entries should be signed and dated. All members of the field investigation should use this notebook. It should be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence.

8.0 CORRECTIONS TO DOCUMENTATION

Unless prohibited by weather conditions, all original data should be recorded in field notebooks, Sample Identification Tags and Chain-of-Custody Records are written with waterproof ink. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one individual, that individual may make corrections simply by crossing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

9.0 SAMPLE NUMBERING

All samples of water and earth materials will be assigned a number by Hydrometrics. The numbers assigned for water samples will all use the project prefix and will be followed by a sequential number. The first sequential number will be 1 and a total of 5000 numbers are available for project water samples. A water sample may consist of several bottles if the sample is to be analyzed for several parameters, each requiring a different preservation technique. All bottles for a sample will have the same sample number. Sampling data including site identification and sample numbers will be recorded in the field sampler's notebook to allow positive identification of the sample.

All samples of earth materials such as drilling cores from test wells and stream bottom sediment will be assigned a number by Hydrometrics. The numbers assigned for earth material samples will use the project prefix and will be followed by a sequential number. The first sequential number will be 5001 and a total of 4999 numbers are available for these samples. Sampling data and sample numbers for earth materials will be recorded and handled in the same manner as for water samples.

The laboratory will not be aware of the specific sample source. All quality control samples will use the same sample numbering method.

10.0 ASSOCIATED REFERENCES

National Water Well Association, 1986. RCRA Groundwater Monitoring Technical Enforcement Document. September.

U.S. EPA, 1986. Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, Vol. II: Field Manual Physical/Chemical Methods. November.

STANDARD OPERATING PROCEDURE

FIELD NOTEBOOKS
HF-SOP-31

1.0 PURPOSE

Field notebooks are intended to provide sufficient data and observations to enable project participants to reconstruct events that occurred during the project and to refresh the memories of field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence.

2.0 EQUIPMENT

Bound notebook with water resistant pages
Pen with indelible ink

3.0 PROCEDURE

A bound field notebook must be maintained by the Field Team Leader to provide a daily record of significant events, observations and measurements during field investigations. All members of the field investigation should use this notebook and initial their entries. It should be kept as a permanent record. All information called for in the Work Plan must be recorded, and any other data pertinent to the investigation at hand.

General information recorded in the field notebooks **must** include:

- Date and time;
- Weather conditions;
- Site name and description (if the first visit);
- Names of individuals participating in and/or observing sampling; and
- Unusual circumstances (unlocked well lid, missing staff gage, flood stage, etc.).

In addition, sampling personnel must record descriptions of sampling activities and parameters determined at each sampling station, appropriate to the type of media being sampled. This should include (but is not limited to) the following:

1) For water sampling (surface water and/or groundwater):

Water level measurement
Flow measurement
Sample collection:
- Site number
- Sample code number
- Date and time
- Bottle size(s)
- Sample tag number (for Superfund investigations)
- Bottle quality control number (for Superfund)
- Dissolved Oxygen
- Water Temperature
- Specific conductivity
- Calibration of Field Equipment
- Preservative(s)
- pH
- Filtration

2) For soil sampling and/or sediment sampling:

Soil moisture conditions
Soil type (textural classification)
Sample collection

- Site number
- Sample code number
- Date and time
- Sample tag number (for Superfund investigations)

Sketch map of property, designated sample units and sample locations (for soil samples), or cross-section of stream sampled and approximate grab sample locations (for sediment samples).

Site descriptions should be adequate for someone unfamiliar with the site to relocate sampling point, and should be particularly detailed if this is the first sampling.

Other information deemed pertinent to sampling procedures and field conditions should be entered in field notebooks. This should include (at a minimum):

1. Notes confirming that calibration of field instruments (pH, SC, DO, etc.) was performed prior to sampling;

2. Notes detailing decontamination procedures performed (methods, any reagents used);

3. Notes describing the source of DI water used for decontamination or for collection of blanks; and

4. Notes describing shipment of samples to the laboratory and any enclosures included as part of such shipments (chain-of-custody, parameter lists, etc.).

All field notes should be entered into bound notebooks with indelible ink. Corrections should be made by deleting incorrect information with a single line and initialing the deletion in the field notebook. Each page should be numbered consecutively and signed by field personnel. All field records should be kept under custody of the Field Team Leader. Copies of the field records should be available for distribution to all team members for data reduction and report preparation.

STANDARD OPERATING PROCEDURE

CROSS-SECTIONAL DRILL CUTTING SAMPLE COLLECTION FOR WOOD AND SIMILAR MATERIAL © (HM-SOP-47)

1.0 PURPOSE

The purpose of drill cutting sampling is to determine residual metals and arsenic concentrations on the surface and internal portions of such materials as wood, timbers, and other similar items with potentially porous surfaces.

2.0 EQUIPMENT

Heavy duty electric drill or brace
1-inch drill bit
Stainless steel knife
Plastic ziplock bags
Waterproof ink marker
Clean plastic sheeting
Cutting catchment basket
(18 inches x 18 inches)

3.0 PROCEDURE

1. Underlay the sampled timber (or other to-be-cored material) with clean plastic sheeting. In high locations such as in-place rafter timbers or other wood support structure, a cutting catchment basket lined with clean plastic sheeting may be used. The basket would be suspended below the sample core area by inserting a standard screw eyelet.

2. Drill a cross-sectional sample through the entire thickness of a sample beam, post, or other building timber material using an electric drill equipped with a 1-inch diameter drill bit. Cuttings during the drilling process will be collected using underlaying plastic sheeting which will prevent contamination from the ground or floor surface, and allow easy collection of cuttings.

3. Collect the wood shavings and place in a sample collection ziplock bag. Double bag all samples.

4. Label ziplock bag with waterproof ink marker. In addition prepare EPA tag labels in accordance with **HF-SOP-4**, and insert label between inner and outer ziplock bag.

5. Decontaminate the drill bit, knife, and other sampling implements using deionized (DI) water in accordance with procedures described in **HF-SOP-7**.

6. Collect additional cutting samples following Steps 1 through 4 and composite sample as designed in accordance with Field Sampling Protocol. In general, the sample program

would consist of three cutting samples composited for one analysis per 1,000 cubic feet of wood or a minimum of 3 sample analyses per structure (9 sample points, composited into 3 analytical samples).

7. Package and ship samples in accordance with **HF-SOP-4**.

NOTE: Samples collected for TCLP analyses should be a minimum of 200 grams.

STANDARD OPERATING PROCEDURE

CHIP SAMPLE COLLECTION©
(HM-SOP-37)

1.0 PURPOSE

The following procedure may be used for collection of chip samples. Chip samples may be collected from concrete, brick or other difficult to sample debris.

2.0 EQUIPMENT

Steel Chisel	Magic Marker
Hammer	Ziplock Plastic Bags or Clear Glass Jars

3.0 PROCEDURE

1. Select a representative sampling location.

2. Using a clean steel chisel, obtain sample chips from the items being sampled. A sample of about 200 grams is sufficient.

3. Transfer the sample into a clean glass jar or a double ziplock bag. Label using procedures described in **HF-SOP-4** and **HF-SOP-5**.

4. Decontaminate using procedures described in **HF-SOP-7**.

ATTACHMENT D

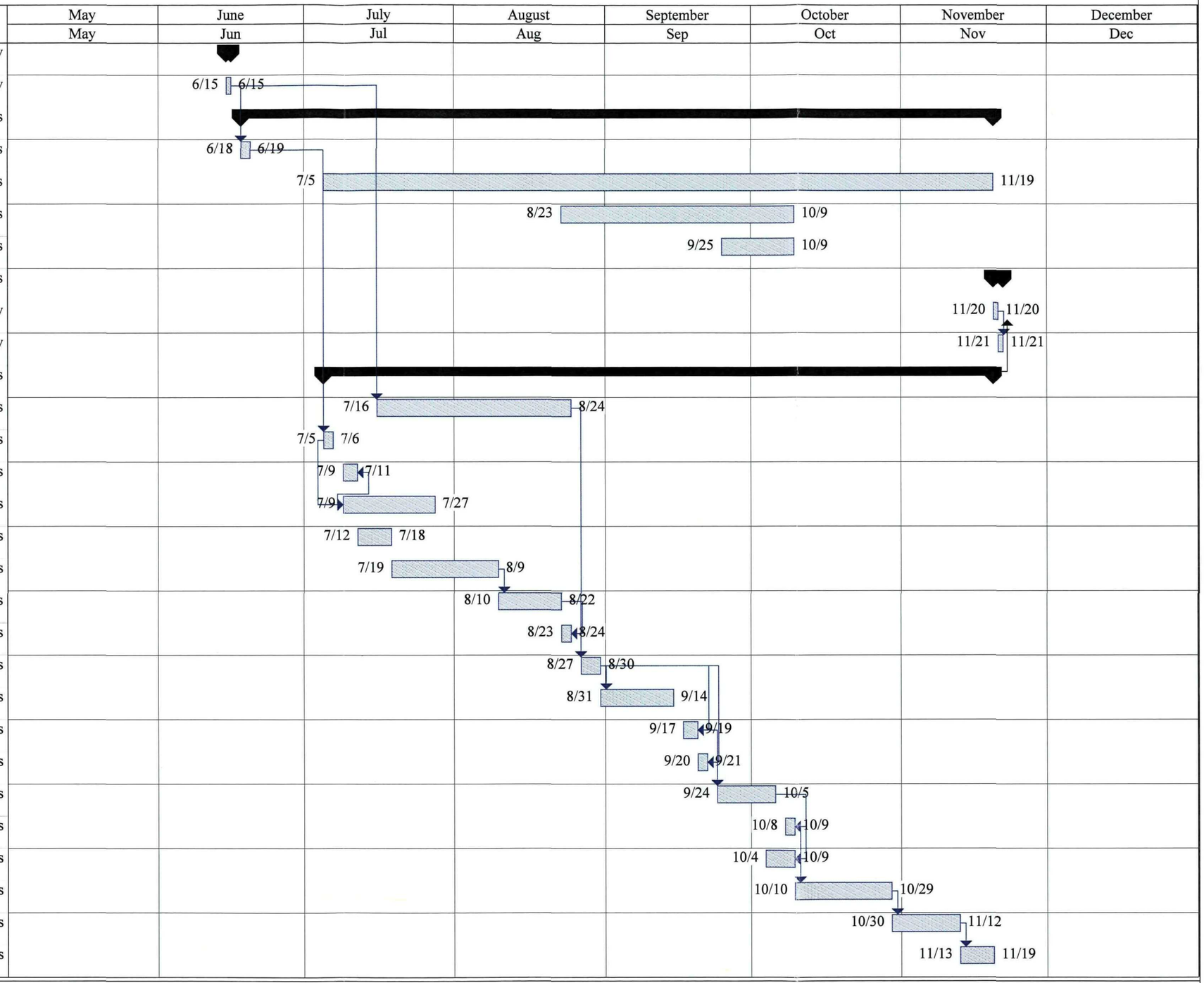
POST-CLOSURE COST ESTIMATE

APPENDIX F

CONSTRUCTION SCHEDULE

APPENDIX F CONSTRUCTION SCHEDULE

ID	Task Name	Duration
1	**Contractor Selection**	1 day
2	EPA Approval	1 day
3	**Construction Oversight**	111 days
4	Preconstruction Conference	2 days
5	Construction Oversight	98 days
6	Liner Cell QC	34 days
7	QC Testing	11 days
8	**Project Close Out**	2 days
9	Notice of Completion	1 day
10	Reporting	1 day
11	**Construction**	98 days
12	Order Liner	30 days
13	Site Layout	2 days
14	Mobilization	3 days
15	Construct Access Roads	15 days
16	Strip Topsoil/ Subsoil	5 days
17	Excavate Soils	16 days
18	Place/compact CCL	9 days
19	Grade/roll Surface for GCL	2 days
20	Install GCL	4 days
21	Install FML	11 days
22	Install Geocomposite	3 days
23	Install Stand Pipe	2 days
24	Install FML	10 days
25	Install Geocomposite	2 days
26	Install Stand Pipe	4 days
27	Haul Waste	14 days
28	Place Temporary Cap	10 days
29	Demobilze	5 days



Project: CAMU PHASE 2 CELL
Date: Wed 6/13/07

Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | External Milestone
Progress | Summary | Rolled Up Milestone | Split | Project Summary | Deadline

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APPENDIX G

CONSTRUCTION QUALITY ASSURANCE PLAN

APPENDIX G

CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR THE ASARCO EAST HELENA CORRECTIVE ACTION MANAGEMENT UNIT (CAMU) PHASE 2 CELL

Prepared for:

ASARCO LLC
P.O. Box 1230
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Prepared by:

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May 2007
Revised June 2007

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TABLE 4-1. STOCKPILE ACCEPTANCE TESTING

Parameter	Test Method	Frequency	Test Standard	Rejection Criteria
Soil Type and Quality	Visual	Continuous	Maximum particle size <1 inch	Reject any excavated material that has not been screened to 1 inch minus
Liquid and Plastic Limits	ASTM D-4318	1 per 1,000 cy	PI>8	Reject portions of the stockpile not meeting the standard or conduct additional hydraulic conductivity tests with failing soils
Remolded Hydraulic Conductivity	ASTM D-5084	1 per 3,500 cy or minimum of 6 tests	Hydraulic conductivity must not exceed $1x10^{-6}$cm/sec	Reject portions of the stockpile not meeting standard.

Concurrent with QC testing, the Engineering Inspector will conduct QA testing. Table 4-3 lists QA testing requirements.

Following completion of the CCL to the lines and grades shown on the drawings, the Engineer will conduct confirmation testing. The test shall consist of an in place hydraulic conductivity test conducted per ASTM D-5084. A full depth sample shall be taken using methods of ASTM D-1587 from a location selected by the Engineer. The sample will be separated into three distinct specimens and each sample tested. The Engineer shall consider the results and, if any of the specimens have a hydraulic conductivity in excess of $1x10^{-6}$cm/sec, will consult with EPA on what actions will be taken to mitigate the overall conductivity of the CCL.

Both the in-place hydraulic conductivity test and a number of other tests as well as stake placement (if necessary) will result in penetrations of the CCL or a portion of the CCL. The Contractor shall patch these penetrations by placing approved CCL material in each penetration in a lift not to exceed two inches and firmly compacting the CCL materials by hand tamping. A tamper with a tamping head roughly the size of the penetration shall be used. QC measures for hole repairs shall consist of continuous oversight and documentation of the repair. QA measures shall consist of oversight of at least 20% of all hole repairs.

8.0 LEACHATE COLLECTION AND DETECTION SUMPS AND PIPING

Perforated piping and smooth solid piping are used in the project's leachate collection and detection systems. QA/QC measures for piping shall include obtaining manufacturer's certifications that the materials meet the project specifications, survey verification of pipe grades, verification that pipe joints were constructed according to the specifications, and verification that the pipe is not damaged during backfilling. QA/QC measures for the concrete sump base include verification of formwork to ensure it is complete and has the specified dimensions, verification of concrete placement, and verification of concrete properties.

During construction of the Leachate Collection and Detection Systems, the Contractor shall perform QC tests according to Table 8-1. The Engineering Inspector shall perform QA tests of the same type and at the same frequency as those tests shown in Table 8-1.

TABLE 8-1. QA/QC MEASURES FOR LEACHATE COLLECTION AND DETECTION SUMPS AND PIPING

Parameter	Test Method	Testing Frequency	Test Standard	Rejection Criteria
Pipe Grade	Visual/Level	100%		Manually move piping to meet grade specifications
Pipe Joints	Visual			Repair joints to meet joint specifications.
Backfilling over Pipe	Visual		No damage	Remove and replace all piping damaged during backfilling.
Sump Formwork	Visual			Repair formwork not meeting the required dimensions
Concrete Strength	ASTM C-78	1 per truck	3000 psi 28-day Strength	Reject concrete not meeting the required 28-day strength

9.0 REFERENCES

AASHTO T-99, "The Moisture Density Relations of Soils Using 2.5 kg (5.5 lb) Rammer and a 305mm (12 inch) Drop."

ASTM C-78, "Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)."

ASTM D-422, "Standard Method for Particle-Size Analysis of Soils."

ASTM D-638, "Type M-1, "Tensile Properties of Plastics."

ASTM D-698, "Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort."

ASTM D-1505, "Standard Test Method for Density of Plastic by the Density-Gradient Technique."

ASTM D-1556, "Test Method for Density of Soil In Place by the Sand-Cone Method."

ASTM D-1587, "Standard Practice for Thin-walled Tube Sampling and Soils."

ASTM D-1603, "Standard Test Method for Carbon Black in Olefin Plastics."

ASTM D-1621, "Compressive Properties of Rapid Cellular Plastics."

ASTM D-2216, "Laboratory Determination of Water (Moisture) Content of Rock and Soil."

ASTM D-2922, "Standard Test Methods for Density of Soil and Soil Aggregate In-Place by Nuclear Methods (Shallow Depth)."

ASTM D-3015, ""Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds."

ASTM D-3017, "Standard Test Methods for Water Content of Soil and Rock In-Place by Nuclear Methods (Shallow Depth)."

ASTM D-4318, "Liquid Limit, Plastic Limit and Plasticity Index of Soils."

ASTM D-4437, "Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes."

ASTM D-4716, "Standard Test Method for Constant Head Hydraulic Transmissivity (In-plane Flow) of Geotextiles and Geotextile Related Product."

ASTM D-5084, "Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter."

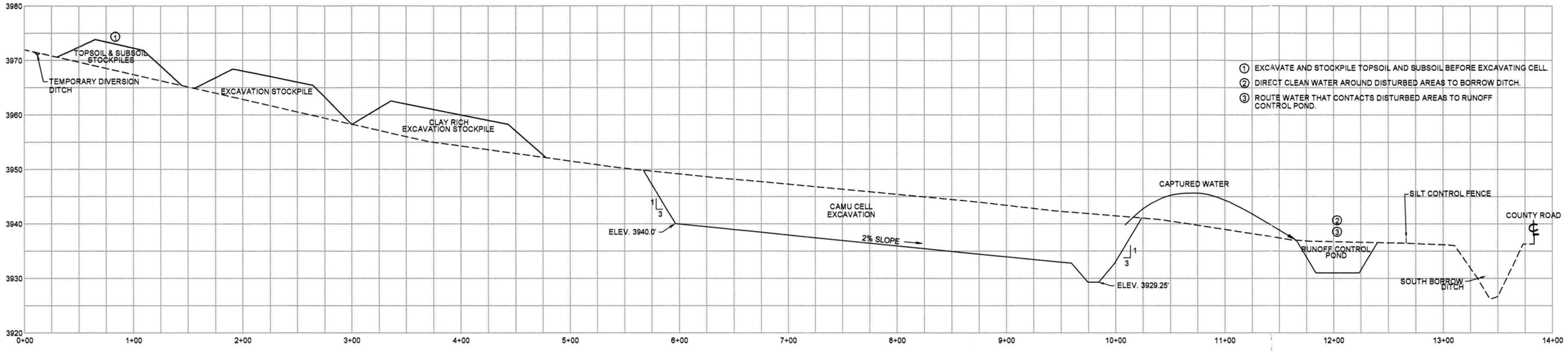
APPENDIX H

RESERVED

(PREVIOUS MATERIAL INCLUDED IN THIS APPENDIX
HAS BEEN MOVED TO APPENDIX E)

APPENDIX I

PROJECT DRAWINGS



SECTION (A) EXCAVATION PHASE
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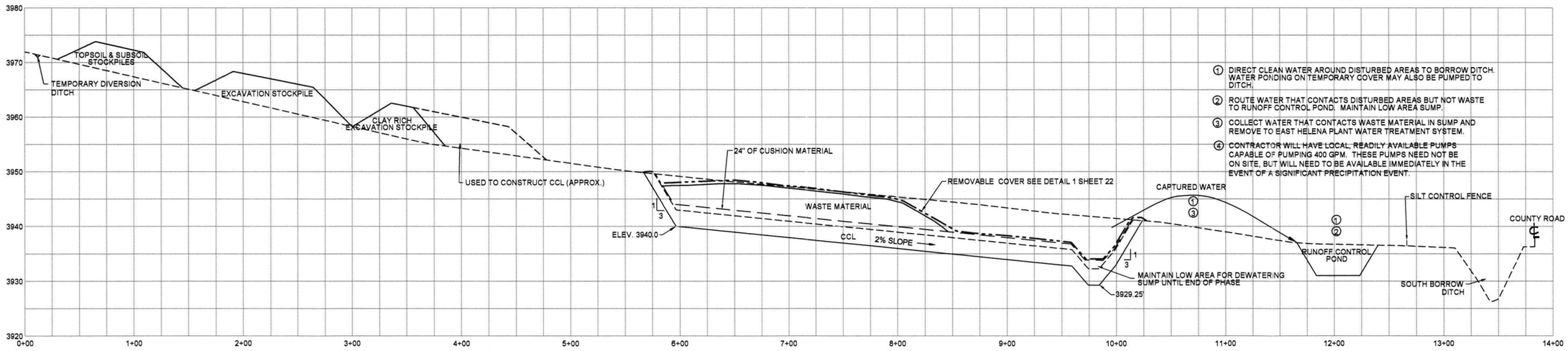

SECTION (B) DURING INTERMEDIATE WASTE MATERIAL PLACEMENT PHASE
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REVISIONS	NO	BY	DATE	DESCRIPTION

REVISIONS	NO	BY	DATE	

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
0 ——— 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

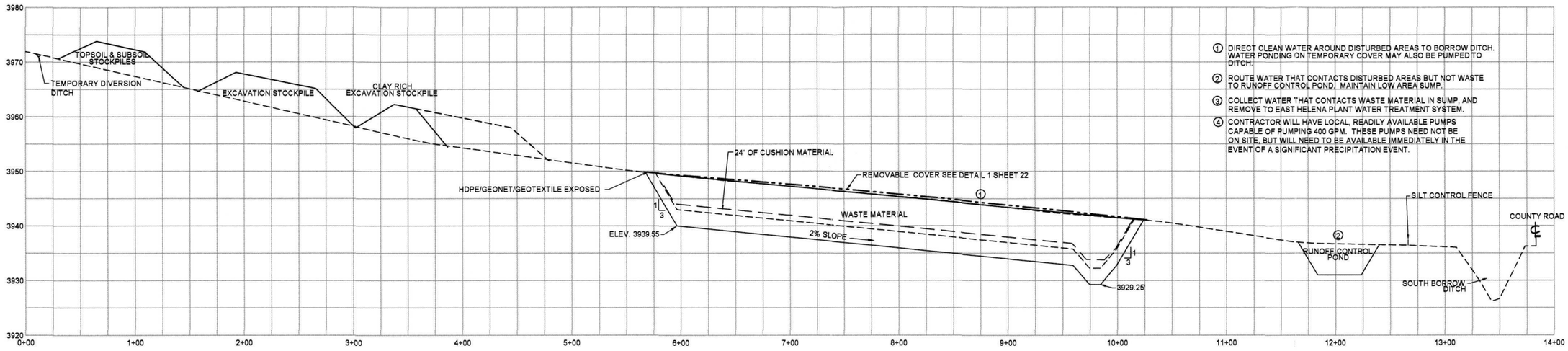
Project No.: 6052		
DRAWN BY	SDP	12/03/06
CHECKED BY	MWR	1/17/07
APPROVED BY	MJO	1/19/07
SCALE: AS NOTED		

Hydrometrics, Inc.
Consulting Scientists and Engineers
Helena, Montana 59601
3020 Bozeman Avenue
(406) 443-4150

ASARCO LLC - EAST HELENA PLANT
CAMU PHASE 2 CELL PROJECT
EROSION CONTROL PLAN
WASTE PLACEMENT

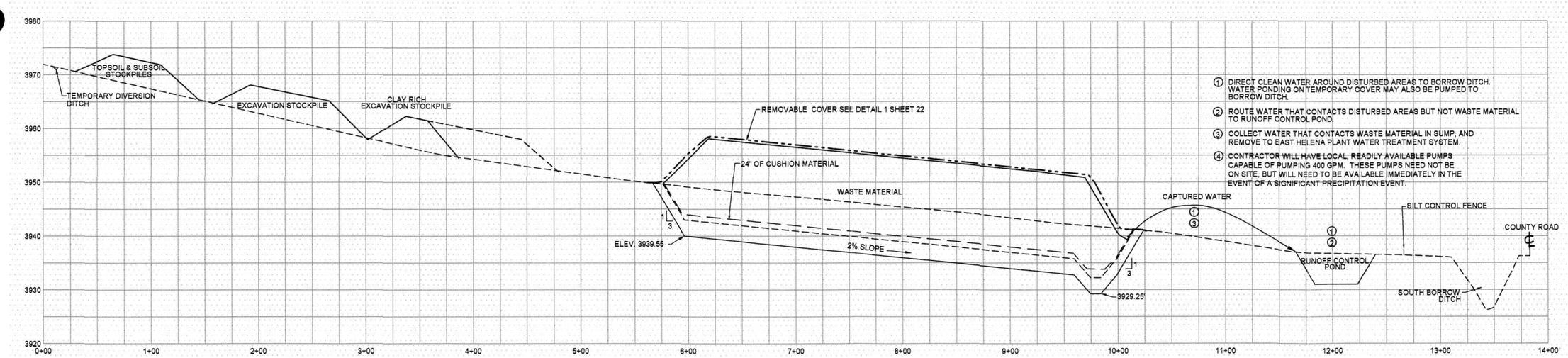
DRAWING FILE NUMBER
605202H026.dwg
AUTOCAD 2004 DRAWING (DWG)
SHEET NUMBER 26
REV △

UPDATE TIME: 1:15PM
MWR \\HEL\012407\F\Land Projects\605202\DWG\605202H026.dwg



SECTION C
SCALE: (H) 1"=50' (V) 1"=10'

CLOSURE OF 2007 CONSTRUCTION YEAR WASTE MATERIAL PLACEMENT PHASE



SECTION D
SCALE: (H) 1"=50' (V) 1"=10'

FINAL WASTE MATERIAL PLACEMENT PHASE

(NOT INCLUDED IN THIS PHASE)

REVISIONS	NO	BY	DATE	DESCRIPTION

REVISIONS	NO	BY	DATE	

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Project No.: 6052		
DRAWN BY	SDP	1/4/07
CHECKED BY	MWR	1/17/07
APPROVED BY	MJO	1/18/07
SCALE: AS NOTED		

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CAMU PHASE 2 CELL PROJECT
EROSION CONTROL PLAN
WASTE PLACEMENT

DRAWING FILE NUMBER: 605202H027.dwg
AUTOCAD 2004 DRAWING (DWG)
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REV: △

UPDATE TIME: 1:16PM
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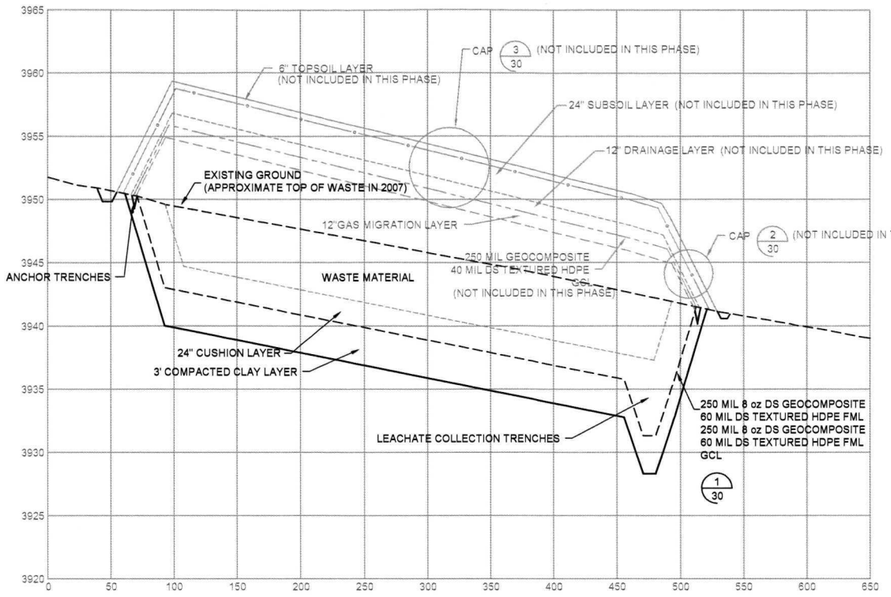

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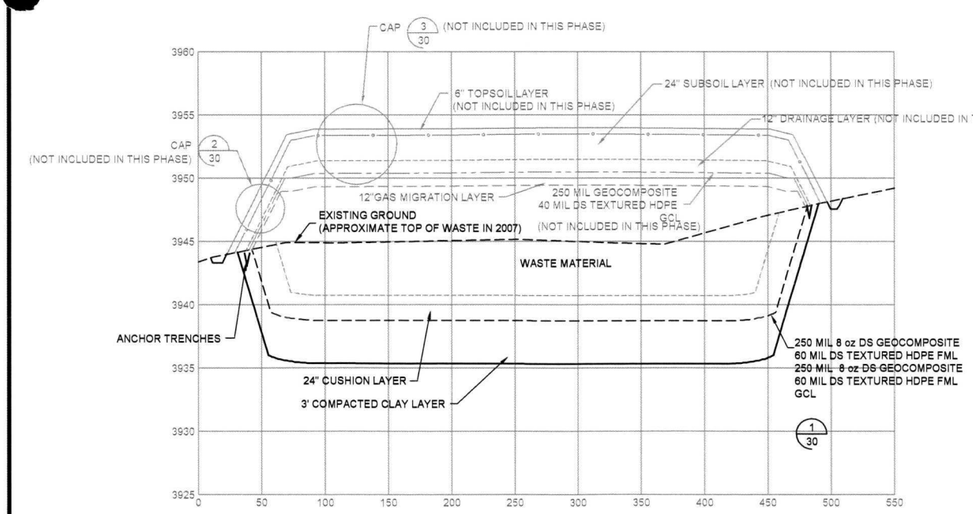

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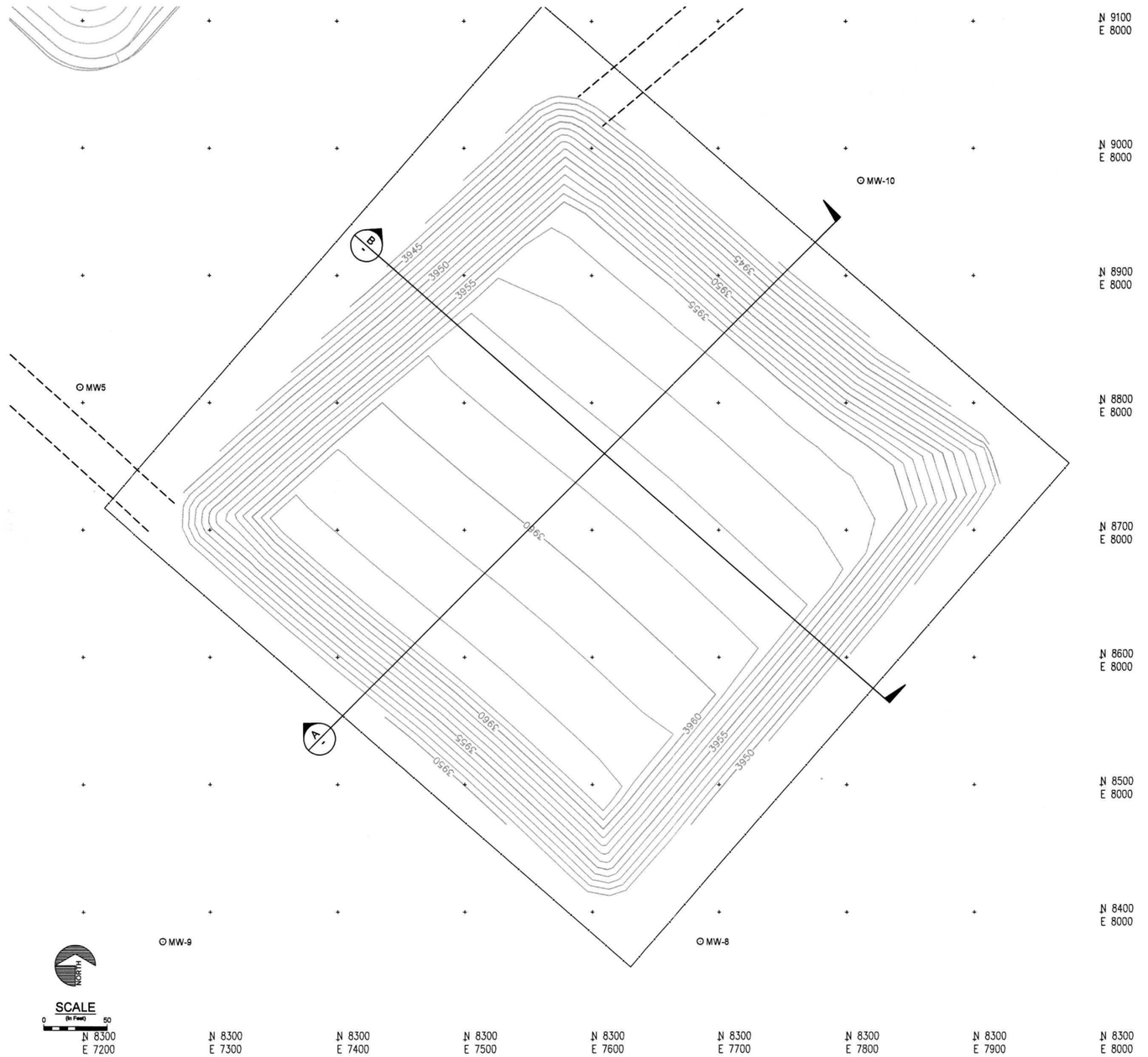

CAMU PLAN VIEW
SCALE: 1"=50'

GRAYED BACK ITEMS NOT INCLUDED IN THIS PHASE

REVISIONS	NO	BY	DATE	DESCRIPTION
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Project No.: 6052		
DRAWN BY	SDP	12/18/06
CHECKED BY	MWR	1/18/07
APPROVED BY	MJO	1/19/07
SCALE: AS NOTED		

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ASARCO LLC - EAST HELENA PLANT
CAMU PHASE 2 CELL PROJECT
CROSS SECTIONS

DRAWING FILE NUMBER: 605202H028.dwg
AUTOCAD 2004 DRAWING (DWG)
SHEET NUMBER: 28
REV: △

UPDATE TIME: 5:49PM
SDP \\HEL\012407\r\Land Projects\605202\DWG\605202H028.dwg

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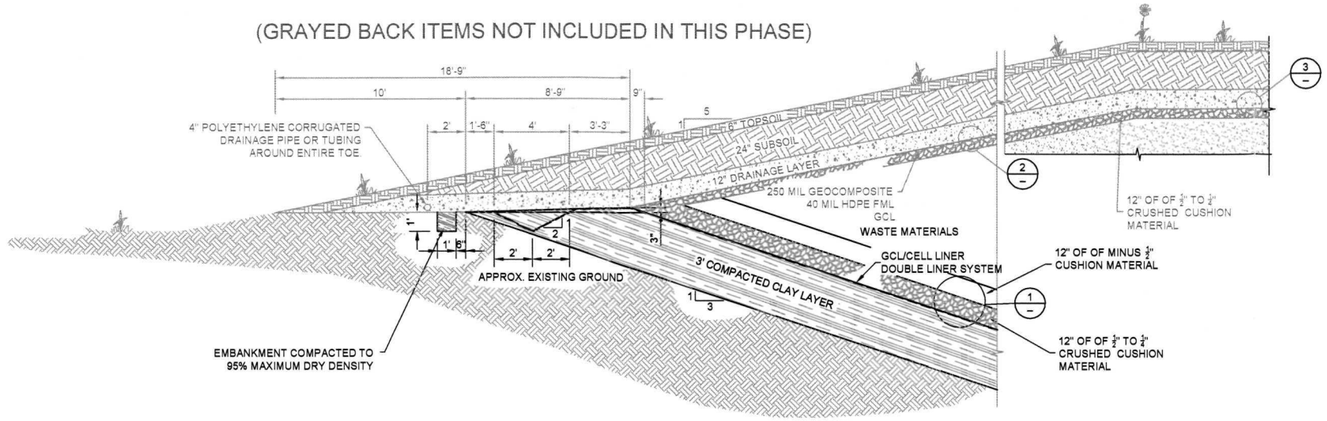
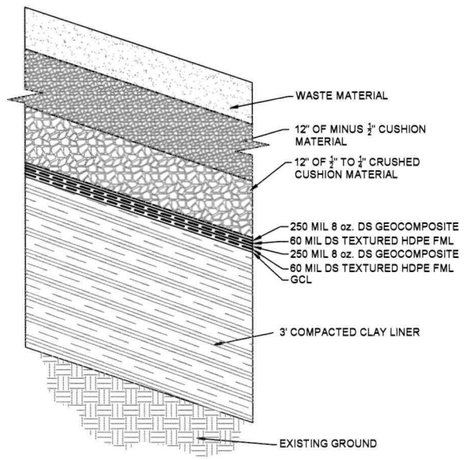
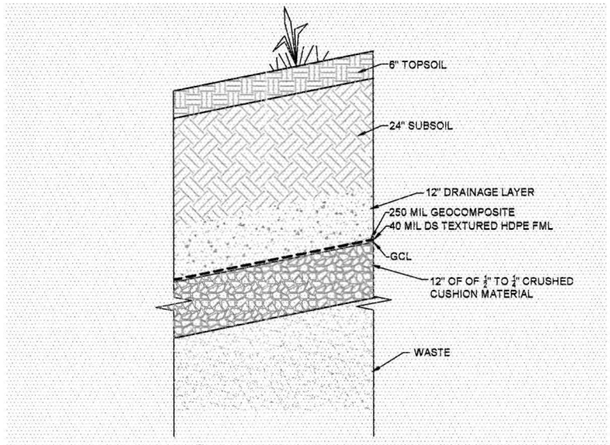


TYPICAL SECTION OF COMPLETED CAMU PHASE 2 CELL

SCALE: 1"=4'



1 DETAIL
TYPICAL BOTTOM LINER
SCALE: NTS



2 DETAIL
TYPICAL CAP CONSTRUCTION ON SLOPES
SCALE: NTS

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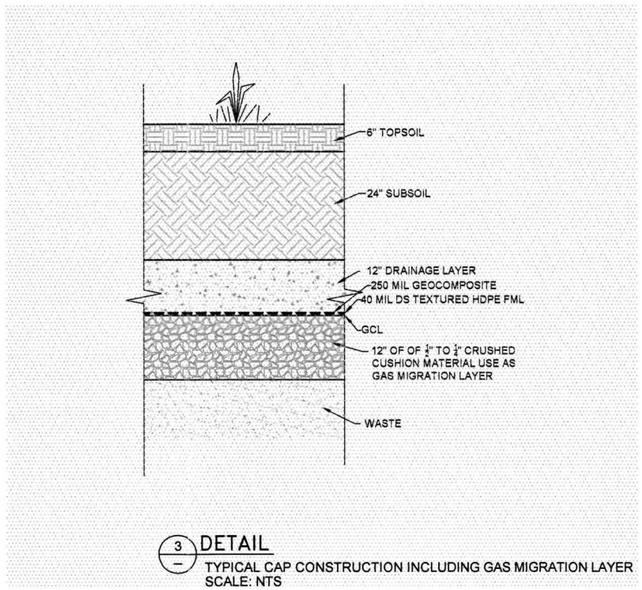
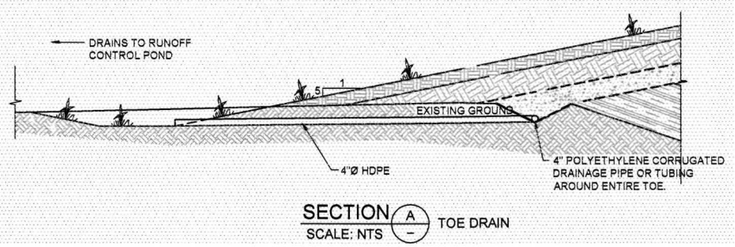


3 DETAIL
TYPICAL CAP CONSTRUCTION INCLUDING GAS MIGRATION LAYER
SCALE: NTS

(NOT INCLUDED IN THIS PHASE)



SECTION A TOE DRAIN
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(NOT INCLUDED IN THIS PHASE)

REVISIONS	NO	BY	DATE	DESCRIPTION
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	1	MWR	4/26/07	REVISED CUSHION LAYER THICKNESS AND GRADATION

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Project No.: 6052		
DRAWN BY	SDP	12/28/06
CHECKED BY	MWR	1/11/07
APPROVED BY	MJO	1/12/07
SCALE: AS NOTED		

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ASARCO LLC - EAST HELENA PLANT
CAMU PHASE 2 CELL PROJECT
CAP AND BOTTOM LINER DETAILS

DRAWING FILE NUMBER
605202H030.dwg
AUTOCAD 2004 DRAWING (DWG)
SHEET NUMBER 30
REV

UPDATE TIME: 1:17PM
MWR \\HEL\D124071\I\Land Projects\605202\DWG\605202H030.dwg

APPENDIX J

PROJECT SPECIFICATIONS

TABLE 4-1. STOCKPILE ACCEPTANCE TESTING

Parameter	Test Method	Frequency	Test Standard	Rejection Criteria
Soil Type and Quality	Visual	Continuous	Maximum particle size <1 inch	Reject any excavated material that has not been screened to 1 inch minus
Liquid and Plastic Limits	ASTM D-4318	1 per 1,000 cy	PI>8	Reject portions of the stockpile not meeting the standard or conduct additional hydraulic conductivity tests with failing soils
Remolded Hydraulic Conductivity	ASTM D-5084	1 per 3,500 cy or minimum of 6 tests	Hydraulic conductivity must not exceed $1x10^{-6}$cm/sec	Reject portions of the stockpile not meeting standard.

TABLE 4-2. QC TESTING FOR CCL PLACEMENT

Parameter	Test Method	Frequency	Test Standard	Rejection Criteria
Soil Type and Quality	Visual	Continuous	Maximum particle size <1 inch	Reject all material that has not been screened to 1 inch minus
Scarification	Visual/Tape Measure	100%	Surface scarified to a depth of 0.5-2.0 inches and a spacing of 6-12 inches before accepting additional lifts	Recompact and/or scarify any surface not meeting standard
In-Place Density	ASTM D-2922	5 per acre per lift	95% of maximum dry density Less than 3% of all densities may not meet the standard above. Of those not meeting standard, no dry density less than 5 pcf less than 95% of maximum dry density. Sample locations shall be selected by the Engineering Inspector based on grid pattern established at project outset.	Reject and reprocess those areas with dry density less than 5 pcf less than 95% of maximum dry density or if cumulative failures exceed 3% of all tests
In-Place Water Content	ASTM D-3017	5 per acre per lift	Less than 3% of all measured water content may have water content wetter than +2% or dryer than –3% of optimum	Reject or reprocess material that exceeds both +2%/-3% criteria
Construction Stakes for Grade Control	Daily Inventory	Daily	Contractor must return all construction stakes used for grade control at the end of each shift to the Engineering Inspector	Reject and replace day's work if stake or portion of stake used near CCL boundary is missing
Proctor Moisture Density Curve	ASTM D-698 or AASHTO T-99	1 per 2,500 cy	N/A	N/A
Compactive Effort	Visual	Continuous	Contractor to establish rolling pattern and equipment that produces necessary compaction	Rework all areas not sufficiently compacted
Lift Thickness	Visual/Tape Measure	5 per acre per lift	No loose lift thickness shall exceed 6 inches. Smaller lifts may be necessary to meet compaction requirements	Remove excess lift thickness.
Hole Repair	Visual	100%	Firmly packed	Reject and replace holes not repaired or incompletely repaired.

Contractor's convenience, the subgrade shall be restored by the Contractor and at his expense, to a condition at least equal to the undisturbed foundation as determined by the Engineer.

2. The Contractor shall remove any surface layer of unsuitable material at the planned grade of the excavation, as determined by the Engineer, from the site.

C. Excavations for Ditches and Drainage Structures. Excavations for ditches and drainage structures shall be accomplished by cutting accurately the line, grade and cross-section required. Trenches and pits shall be of sufficient size to accommodate the installation of piping and structures. Excessive open ditch excavation shall be backfilled with satisfactory materials to the grades shown on the design Drawings. The Contractor shall maintain all excavations free from detrimental quantities of brush, sticks, trash and other debris.

D. Soil Salvage

1. The Contractor shall stockpile the top 8 inches of excavated soil for use as topsoil in the landfill cap.

2. The Contractor shall stockpile the next 16 inches of soil for use as subsoil in the landfill cap.

3. The remainder of excavated clayey sand clay, and silt (sandy loam) material from the landfill cell excavation shall be stockpiled for use in construction of the compacted clay liner. Clay rich soils will be segregated and stockpiled separately from sandier soils. The Engineer will determine material types. Determination limits to be concurred by Contractor.

4. Stockpiles shall be covered or provided with runoff containment in accordance with best management practices for preventing storm water pollution.

E. Subgrade Preparations

1. **General Requirements.** Subgrade shall be shaped to the line, grade and cross-section and compacted as specified for all required embankments and in the CAMU cell. This operation shall include plowing, disking and any moistening or aeration required to obtain proper compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory material as directed by the Engineer.

   Low areas resulting from the removal of unsatisfactory material shall be brought up to the required grade with satisfactory materials, and the entire subgrade shall be shaped to the line, grade and cross-section and compacted as specified.

   After rolling, the elevation of the finished subgrade shall not vary more than 0.2 foot from the established grade and approved cross-section.

2. **Compaction.** Compaction shall be accomplished by sheepsfoot rollers to at least 90 percent of Proctor maximum dry density.

203.07.8 Embankment

A. Materials

1. **Compacted Clay Liner.** The compacted clay liner shall consist of clay-rich sandy loam material from excavation required for the landfill cell. Cobbles and rock fragments having maximum dimensions of more than 1-inch shall be screened from clay soil used in these liners. Should cobbles and rock fragments of such size be found in otherwise approved earth fill materials, they shall be removed by the Contractor before the materials in the earth fill are rolled and compacted. No brush, roots, sod, or other perishable or unsuitable materials shall be placed in the clay liner or earth cap. Clay-rich soils will be used for the compacted clay liner. Soils with less clay content will be used for the cover soil.

2. **Cushion Material.** The CAMU Phase 2 Cell shall have cushion course placed between the installed liner systems and the larger graded backfill placed in the center of the cell. The cushion material shall be 24" perpendicular to the liner systems along the bottom and sides of the cell. The bottom 12" of the cushion layer shall consist solely of imported gravel between ½" and ¼". The top 12" shall consist of imported gravel passing the ½" screen. This 24" cushion layer will be maintained over the side walls and bottom of the cell at all times.

3. **Waste Material.** The CAMU Phase 2 cell backfill materials shall consist of materials from source area excavations and demolition debris. Backfill materials are required to have 100% of the material to be less than 2 feet in diameter and no liquid wastes will be placed in the CAMU Phase 2 Cell. It is anticipated that debris and concrete from demolition will require size reduction to meet the required gradations. All material requiring size reduction will be resized at the structure demolition site and all stored material requiring size reduction will be resized at the location the material is stored.

4. **Leachate Collection Trench Drain Materials**. The leachate collection trench drainage material shall consist of well graded sand and gravel that is subrounded to round, screened and washed free of vegetable matter, clays, and other deleterious substances that could in time change the hydraulic conductivity of the drainage layer. The gradation of the drainage layer material shall lie within the range shown in Table 3.

5. **Topsoil and Subsoil**. The Contractor shall obtain topsoil and subsoil from soil salvage stockpiles, as described in section 203.07.7 (D)(1) and 203.07.7 (D)(2). Topsoil shall be free of trash, rocks, hard lumps of soil, and stubble. Subsoil shall be free of sharp or jagged rocks, roots, and debris.

2. **Waste Material.** The contractor shall provide a temporary 25-mil RPE OR Liner for the waste material placed in the landfill cell. Special care must be taken to ensure that the waste is covered prior to significant occurrences of precipitation. In addition, the Contractor shall ensure that the waste is placed in a manner that will ensure that the water which falls on the temporary liner will drain to a sump without coming in contact with the waste material and without significant ponding of the water on the temporary liner. The water reaching the sump shall immediately be discharged to the storm water retention pond shown on the Drawings. Therefore, the storm water retention pond shall be constructed prior to placing waste material into the landfill cell. Any storm water coming in contact with the waste material shall not be discharged but shall be removed by the Contractor to the Plant water treatment system.

3. **Leachate Collection Trench Drain Material.** The Contractor shall place the drain material in a single layer, taking care to protect the underlying flexible membrane layer.

C. Compaction

1. **Compacted Clay Liner.** Except for final preparation of the clay liner to receive the flexible membranes, compaction shall be accomplished by sheepsfoot rollers. The sheepsfoot roller shall have compaction feet of sufficient length to fully penetrate the lift thickness being placed. A smooth drum roller shall be used to provide a smooth top surface of the clay liner once it is ready to receive the flexible membrane liner. The bottom clay liner in the landfill cell shall be compacted to 95 percent of Proctor maximum dry density. Compact the top 6 inches of the subgrade to 90 percent Proctor maximum dry density prior to placement of the compacted clay liner.

    a. **Moisture Control.** The standard optimum moisture content is defined as, "That moisture content which will result in a maximum dry unit weight of the soil when subjected to the ASTM D-698-70, Method A., Proctor Compaction Test." the maximum dry weight, in pounds per cubic foot, obtained by the above procedure is the Proctor maximum dry density.

    The moisture content of the clay liner material prior to and during compaction shall be distributed uniformly throughout each layer of the material. The allowable ranges of placement moisture content are based on design considerations. The moisture control shall be such that the moisture content of compacted earth fill, as determined by tests performed by the Engineer, shall be within the following limits:

    Material represented by the samples tested having a placement moisture content more than 2 percent dry of the standard optimum condition, or more than 3 percent wet of the standard optimum condition will be rejected and shall be removed or reworked until the moisture content is between these limits.

Within the above limits, and based on a continuous record of tests made by the Engineer on previously placed and accepted material, the uniformity of placement moisture content shall be such that:

No more than 3 percent of the samples of accepted liner material will be drier than 2 percent dry of the standard optimum moisture content, and no more than 3 percent will be wetter than 3 percent wet of the standard optimum moisture content.

The average moisture content of all accepted embankment material shall be between 0 and 3 percent wet of the standard optimum moisture content.

The Engineer will inform the Contractor when the placement moisture content is near or exceeds the limits of uniformity specified above, and the Contractor shall immediately make adjustments in procedures as necessary to maintain the moisture content within the specified limits.

b. **Density Control.** Density control of compacted earth fill shall be such that the dry density of the compacted material, as determined by tests performed by the Engineer shall conform to the following limits:

    1) **Compacted Clay Liner.** Material represented by samples having a dry density less than 90 percent of its Proctor maximum dry density will be rejected. Such rejected material shall be rolled until a dry density equal to or greater than 95 percent of its Proctor maximum dry density is obtained.

    Within the above limit and based on a continuous record of tests made by the Engineer on previously placed and accepted embankment, the uniformity of dry density shall such that:

    No more than 3 percent of the material represented by the samples tested shall be at dry density less than 95 percent of Proctor maximum dry density.

    The average dry density of all accepted embankment material shall be not less than 95 percent of the average Proctor maximum dry density.

c. Hole Repair. The placement of survey stakes (if used) as well as the performance of density tests, and hydraulic conductivity tests may require the penetration of lifts of the CCL. The contractor shall repair these penetrations by placing two-inch thick lifts of CCL material into the penetration and thoroughly tamping the lift by hand until the penetration has been filled. The tamping bar or item shall be roughly the same size and shape as the penetration.

2. **Cushion Layer.** The Contractor shall not compact the cushion layer but shall lightly roll the layer using nonvibratory compaction equipment with a static weight of 1.5 tons or less to ensure its stability under equipment traffic. Carefully roll the layer under the guidance of the Engineer to ensure that the underlying flexible membrane liner is not damaged.

3. **Leachate Collection Drain Layer.** The Contractor shall not compact the leachate collection drain layer but shall lightly roll the layer using nonvibratory compaction equipment with a static weight of 1.5 tons or less to ensure its stability under equipment traffic.

4. **Drain Layer.** The Contractor shall not compact the drain layer, but shall lightly roll the layer using nonvibratory compaction equipment with a static weight of 1.5 tons or less to ensure its stability under equipment traffic. Carefully roll the layer under the guidance of the Engineer to ensure that the underlying flexible membrane liner is not damaged.

5. **Gas Migration Layer.** The Contractor shall not compact the gas migration layer but shall lightly roll the layer using nonvibratory compaction equipment with a static weight of 1.5 tons or less to ensure its stability under equipment traffic.

6. **Subsoil.** The Contractor shall lightly roll the subsoil using nonvibratory compaction equipment with a static weight of 1.5 tons or less to ensure its stability under equipment traffic.

7. **Waste Materials.** The Contractor shall compact waste soils with a minimum of eight (8) passes (4 cycles) of a padfoot roller. Place the waste soils in a maximum lift thickness of 2 feet. The initial lift, placed directly on the leachate collection geocomposite, shall be no less than 1 foot in thickness and shall be composed of crushed slag, imported gravel, or select fill having particle size less than ½-inch and greater than ¼-inch. This same material shall be used for the last 12-inch lift that will have the cap geosynthetic clay liner placed over it. The second shall be of a similar thickness and material, but having particle size less than ½" . This same material shall be used in the second-to-last 12-inch lift that will have the cap placed over it. This waste cover material shall be approved by the Engineer. No waste material containing sharp, jagged rocks, concrete, roots debris, or any other material, which may puncture the HDPE-FML will be used in this protective layer.

   The Contractor may choose the equipment and manner with which to place the initial lift of waste material in the cell. However, it must be satisfactorily demonstrated to the Engineer that both the equipment and manner used to place the waste material over the liner will not have any detrimental effect on the liner.

D. Finish Grading

The surface of all excavation, fill, embankment and subgrade shall be finished to a reasonable smooth and compact surface in accordance with the lines, grades and cross-sections shown. The degree of finish for all graded areas shall be within 0.2 foot of the grades and elevations indicated. Gutters and ditches shall be finished in manner that will result in effective drainage.

END OF SECTION

6. **Vacuum Box Assembly**. Consists of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole, or valve assembly, and a vacuum gauge for conducting a nondestructive test method which develops a vacuum in a localized region of a geomembrane seam in order to evaluate the seam's tightness and suitability.

623.02 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications

1. The installer shall have worked in a similar capacity on at least five (5) projects similar in complexity to the project described in the Contract Documents and with each project involving at least 100,000 square feet of a similar product.

2. Installation supervisor/field engineer shall have worked in a similar capacity on at least two (2) jobs similar in size and complexity to the project described in the Contract Documents.

3. The manufacturer shall perform the quality control tests listed in Table 4 at the manufacturing plant. Provide all quality control certificate to the Engineer as specified in Section 623.03(B) of these Special Provisions.

TABLE 4. GEOMEMBRANE SPECIFICATIONS

PROPERTY	TEST METHOD	REQUIREMENT		
		DEMO CAP & TEMP CAMU CAP	CAMU CELL	CAMU CAP
Gauge (mils nominal)	ASTM D-1593	20	60	40
Tear Strength (pounds)	ASTM D 1004 or ASTM D 751	125	42	28
Tensile Strength 1. Yield Stress (lb/in) 2. Break Stress (lb/in) 3. Yield Elongation (%) 4. Break Elongation (%)	ASTM D 6693 or ASTM D 2261	340	 126 90 12 100	84 60 12 100
Puncture Resistance (lb)	ASTM D 4833	150	90	60
Stress Crack Resistance (Hours)	ASTM D 5397 Appendix	N/A	300	300

B. Delivery, Storage and Handling

1. Deliver geomembrane to the site only after the Engineer receives and approves the required submittals. Immediately remove damaged or unacceptable material from the site and replaced at no cost to the Owner.

temperatures ranging from (-) minus 30 degrees Fahrenheit to (+) plus 110 degrees Fahrenheit, after the completion of the work on a prorata basis.

b) Should a defect or failure occur within the aforesaid periods, the GCL installer shall bear all costs for repair and/or replacement of the GCL and shall in addition bear all costs for the excavation of any cover backfill that is required to be removed in order to repair and/or replace the GCL. All materials removed to allow repairs to be made shall be reinstalled by the GCL installer in accordance with these special provisions.

625.03 SUBMITTALS

Two copies of the following documents shall be submitted by the Contractor at least three weeks prior to the shipment of the GCL to the site.

1. Conceptual description of the proposed plan for placement of the GCL panels over the area of installation.
2. GCL manufacturer's MQC Plan for documenting compliance of these specifications.
3. A representative sample of the GCLs.
4. A project reference list for the GCL(s) consisting of the principal details for at least ten projects totaling at least 10 million square feet in size.
5. Upon shipment, the Contractor shall furnish the GCL manufacturer's Quality Assurance/Quality Control (QA/QC) certifications to verify that the materials supplied for the project are in accordance with Table 7-1.

625.04 MATERIALS

1. The GCL shall be a needle punched reinforced GCL comprised of a uniform layer of granular sodium bentonite encapsulated between a scrim reinforced non-woven and a virgin staple fiber non-woven geotextile and shall comply with all of the criteria listed in this specification. The needle punched fibers should be thermally fused to the scrim reinforced non-woven geotextile to enhance the reinforcing bond.
2. Reinforced GCL shall be used on this project.
3. The minimum acceptable dimensions of full-size GCL panels shall be 150 feet in length and 13.8 feet in width. Short rolls (those manufactured to a length greater than 70 feet but less than a full-length roll) may be supplied at a rate no greater than 3 per truckload or 3 rolls every 36,000 square of GCL, whichever is less.
4. A 12 -inch overlap guideline shall be imprinted on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap dimension. Lines shall be printed in easily visible, non-toxic ink.
5. The granular bentonite or bentonite sealing compound used for seaming, penetration sealing and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL manufacturer.

625.05.6 Damage Repair

If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible to repair it by cutting a patch to fit over the damaged area. The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 12 inches is achieved around all of the damaged area. Dry bentonite or bentonite mastic shall be applied around the damaged area at a rate of one-half pound per square foot prior to placement of the patch. The Contractor may wish to use an adhesive to affix the patch in place so that it is not displaced during cover placement.

625.05.7 Cover Placement

1. Although direct vehicular contact with the GCL is to be avoided, lightweight, low ground pressure vehicles (such as 4-wheel all-terrain vehicles) may be used to facilitate the installation of geosynthetic material placed over the GCL. The GCL supplier or CQA engineer should be contacted with specific recommendations on the appropriate procedures in this situation.

2. When a textured geomembrane is installed over the GCL, a temporary geosynthetic covering known as a slip sheet or rub sheet should be used to minimize friction during placement and to allow the textured geomembrane to be more easily moved into its final position.

3. Cyclical wetting and drying of GCL covered only with geomembrane can cause overlap separation. Soil cover should be placed promptly whenever possible. Geomembranes should be covered with a white geotextile and/or operations layer without delay to minimize the intensity of wet-dry cycling. If there is the potential for unconfined cyclic wetting and drying over an extended period of time, the longitudinal seam overlaps should be increased based on the project engineer's recommendations.

4. To avoid seam separation, the GCL should not be put in excessive tension by the weight or expansion of textured geomembrane on steep slopes. The project Engineer should be consulted about the potential for GCL tension to develop.

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